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REPORT ON ATLANTIC CANADA

WOOD FRAMING MOISTURE SURVEY

REPORT

on

ATLANTIC CANADA
WOOD FRAMING
MOISTURE SURVEY

MAY 1989

Prepared independantly with consultation by
CMHC/CHBA Joint Task Force Report
on
Moisture Problems in Atlantic Canada
Final Report

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National Research Council
Canadian Building Digest No. 244 - February 1987

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Eastern Species
Forintek Canada Corp.
SP511E - August 1984

Executive Summary

The light wood-frame house construction system has been used successfully in Canada for more than 100 years. There is little question that, with its inherent flexibility and efficient use of renewable resource, it will remain the choice of Canadians into the foreseeable future. In fact, Canadian wood-frame housing has performed so well and for so long that some time passed before it was recognized that refinements to the system were causing it to approach the limit of its tolerance to moisture.

Moisture, directly or indirectly, causes more problems in buildings than any other single cause. The sources of moisture in a house fall into the following four categories:

1. construction moisture
2. ground sources
3. seasonal storage
4. occupants

This report is written to address the issues and concerns related to one of the major contributors of construction moisture, the framing material. Wood materials used in construction often contain significant quantities of moisture. For example, the framing lumber used in construction today is usually quite wet or green, and stamped S-GRN, accordingly. During the first year or two after a house is constructed, the drying of lumber releases an amount of moisture, causing complaints by new homeowners of high relative humidities and condensation problems.

Measures to reduce construction moisture include, ventilating and dehumidifying the house after occupancy to assist the house-drying process. This will help to reduce the humidity levels inside the house, but, there may be moisture trapped inside the walls. This moisture could remain for months or years, dependant on constructions materials and technical details, leading to material degradation and decay. Researchers are discovering that the air-quality in air-tight houses, with little or no ventilation, is quite poor and that a major contributor is moulds, mildews, and wood-inhabiting fungi.

The survey revealed that not one of tested studs had an averaged moisture content level at or below 19% as stated in the National Building Code, Part 9, Section 9.3, Subsection 9.3.2, Article 9.3.2.5. It was discovered that a majority of the framing material including the plywood/board sheathing and trusses had a moisture content level above the recommended "safe" level of under 22% once temperature corrected. (See Appendix'A' for detailed and specific information on each of the six houses tested.)

GLOSSARY OF TERMS

The following are explanations of terms used in this report that might be unfamiliar to the reader or might be used in a particular context. The explanations are meant to clarify statements in the report and, in many cases, do not represent the most scientifically complete explanation.

Air-Dried Lumber - boards and planks that have been allowed to dry, in the open air, to a moisture content of 19 per cent or less. Usually, lumber is stacked so that air can pass freely over both faces of each plank.

Brown Rot - in wood, any decay in which the attack concentrates on the cellulose and associated carbohydrates rather than on the lignin, producing a light to dark brown friable residue - hence loosely termed "dry rot". An advanced stage where the wood splits along rectangular planes, in shrinking, is termed "cubical rot".

Casehardening - a condition of stress and set in dry lumber characterized by compressive stress in outer layers and tensile stress in the centre or core.

Cell - a general term for the structural units of plant tissue, including wood fibers, vessel members, and other elements of diverse structure and function.

Cellulose - the carbohydrate that is the principal constituent of wood and forms the framework of the wood cells.

Collapse - the flattening of single cells or rows of cells in heartwood during the drying or pressure treatment of wood. Often characterized by a carved-in or corrugated appearance of the wood surface.

Decay - the decomposition of wood substance by fungi.
Advanced Decay - the older stage of decay in which the destruction is readily recognized because the wood has become punky, soft and spongy, stringy, ringshaked, pitted, or crumbly. Decided discoloration or bleaching of the rotted wood is often apparent.
Incipient Decay - the early stage of decay that has not proceeded far enough to soften or otherwise perceptibly impair the hardness of the wood. It is usually accompanied by a slight discoloration or bleaching of the wood.

Dew Point - the temperature at which a water vapour begins to deposit as a liquid. Applies especially to water in the atmosphere.

Dimensional Stabilization - special treatment of wood to reduce the swelling and shrinking caused by changes in its moisture content with changes in relative humidity.

Dry Rot - a term loosely applied to any dry, crumbly rot but especially to that which, when in an advanced stage, permits the wood to be crushed easily to a dry powder. The term is actually a misnomer for any decay, since all fungi require considerable moisture for growth.

Equalibrium Moisture Content - the moisture content at which wood neither gains nor loses moisture when surrounded by air at a given reletive humidity and temperature.

Fibre-saturation / Moisture Content - wood is composed largely of cells held together with a natural binder called lignin. The cell walls, the space between the cells and the interior of the cells themselves can be filled with water when the wood is living. As wood dries, the water in and between the cells is driven off first. When all this water has gone but the cell walls remain full, the "fibre-saturation moisture content" has been reached. Any further drying results in the results in the cell walls drying out and shrinking, causing the wood to shrink. At moisture contents below 19 per cent, further shrinkage is minimal.

Green - freshly sawed or undried wood. Wood that has become completely wet after immersion in water would not be considered green, but may be said to be in the "green condition".

Heart Rot - any rot characteristically confined to the heartwood. It generally originates in the living tree.

Heartwood - the wood extending from the pith to the sapwood, the cells of which no longer paricipate in the life processes of the tree. Heartwood may contain phenolic compounds, gums, resins and other materials that usually make it darker and more decay resistant than sapwood.

Kiln - a chamber having controlled air flow, temperature, and relative humidity, for drying lumber, veneer and other wood products.

Kiln-dried lumber - boards and planks that have been dried in ovens (kilns) to a moisture content of less than 19 per cent.

Lignin - the second most abundant constituent of wood, located principally in the secondary wall and the middle lamella, which is the thin cementing layer between wood cells.

Lumber - the product of the saw and planing mill not further manufactured than by sawing, resawing, passing lengthwise through a standard planing machine, crosscutting to length, and matching.

Moisture Content - a measure of the amount of water in a material as wood, "waferboard" or insulation. The moisture content is expressed as a weight of water divided by the weight of dry material it came from. The measurements are stated in a percentage of the weight of the ovendry wood. Moisture contents in excess of 100 per cent are possible.

Ovendry Wood - wood dried to a relatively constant weight in a ventilated oven at 101° to 105 °C.

Pocket Rot - Advanced decay that appears in the form of a hole or pocket, usually surrounded by apparrently sound wood.

Psychometer - an instrument for measuring the amount of water vapour in the atmosphere. It has both a dry-bulb and wet-bulb thermometer. The bulb of the wet-bulb thermometer is kept moistened and is, therefore, cooled by evaporation to a temperature lower than that shown by the dry-bulb thermometer. Because evaporation is greater in dry air, teh difference between the two thermometer readings will be greater when the air is dry than when it is moist.

Relative Humidity - ratio of the amount of water vapour present in the air to that which the air would hold at saturation at the same temperature. It is usually considered on the basis of the weight of the vapour but, for accuracy, should be considered on the basis of vapour pressures.

Sapwood - the wood of pale colour near the outside of the log. Under most conditions the sapwood is more susceptible to decay than heartwood.

Waferboard - a sheathing material formed from wafers (chips) of wood bonded together under heat and pressure. A waterproof resin is used to bond the wafers to each other.

Seasoning - removing moisture from green wood to improve its servicability. Air-dried wood is dried by exposure to air in a yard or shed, without artificial heat. Kiln-dried wood is dried in a kiln with the use of artificial heat.

Soft Rot - a special type of decay developing under very wet conditions (as in cooling towers and boat timbers) in the outer wood layers, caused by cellulose-destroying microfungi that attack the secondary cell walls and not the intercellular layer.

Specific Gravity - As applied to wood, the ratio of the ovendry weight of a volume of water equal to the volume of the sample at a specified moisture content (green, air-dry, or oven-dry).

Stain - A discolouration in wood that may be caused by such diverse agencies as micro-organisms, metal, or chemicals. The term also applies to materials used to impart colour to wood.

Blue stain: A bluish or grayish discolouration of the sapawood caused by the growth of certain dark-coloured fungi on the surface and in the interior of the wood; made possible by the same conditions that favour the growth of other fungi.

Brown stain: A rich brown to deep chocolate brown discolouration of the sapwood of some pines caused by a fungus that acts much like the blue-stain fungi.

Chemical brown stain: A chemical discolouration of wood, which sometimes occurs during the air-drying or kiln-drying of several species.

Sticker stain: A brown or blue stain that develops in seasoning lumber where it has been in contact with the stickers.

Stickers - Strips or boards used to separate the layers of lumber in a pile thus improve air circulation.

Stud - One of a series of slender wood structural members used as supporting elements in a wall and partitions.

Vessels - Wood cells of comparitively large diameter that have open ends and are set one above the other to form continuous tubes. The openings of the vessels on the surface of a piece of wood are usually refered to as pores.

Weathering - The mechanical or chemical disintegration and discolouration of the surface of the wood caused by exposure to light, the action of dust and sand carried by winds, and the alternate shrinking and swelling of the surface fibers with continual variation in moisture content brought by changes in the weather. Weathering does not include decay.

White-rot - In wood, any decay or rot attacking both the cellulose and the lignin, producing a generally whitish residue that may be spongy or stringy rot, or occurs as pocket rot.

1.0 BACKGROUND

The National Building Code of Canada 1985 states "Moisture content of lumber shall be not greater than 19 per cent at the time of installation". This is a technical requirement set with respect to public safety in buildings. Underlying this requirement is the fact that wood installed at a high moisture content will exhibit a greater degree of shrinkage across the grain, as it dries, than wood at a lower moisture content. Differential shrinkage in wood may result in warping, cuupping and twisting. In general, wood at a moisture content of 19 per cent will be in a state where sufficient water will have been driven off to "pre-shrink" it and prevent significant distortion problems upon further drying after installation.

The Drying of Walls Experiment in Atlantic Canada, was originally set up to use framing members containing a high moisture content level, somewhere over thirty percent. This was required so that the framing members could be studied for their ability to dry under different climatic conditions and within different assemblies of materials. It was anticipated that this wood would have to be preconditioned in order to reach this moisture level. However, this proved to be unnecessary as the lumber delivered from the local suppliers to the three test hut sites was well above fibre saturation when it arrived. Framing lumber employed in construction of the test panels was well in excess of the 19 per cent required by the National Building Code of Canada. It was important, therefore, for the Task Force to determine whether this was representative of lumber use in Atlantic Canada

In February 1985, a joint task force, comprising of representatives from Canada Mortgage and Housing Corporation, the Canadian Home Builders' Association and the National Research Council of Canada (Atlantic Region), was formed. The Task Force was charged with investigating the causes of, and solutions to, moisture damage in walls of wood-frame housing in Atlantic Canada.

Over a period of approximately two years, the Task Force oversaw a field-research project and the production of a good-practice, advisory document, and undertook related activities to arrive at the following observations, conclusions and to formulate the following recommendations.

OBSERVATIONS: Test panels which took an extended period of time to dry exhibited some fungal growth on the framing lumber and wood-based sheathing materials.

Framing lumber surveyed in Atlantic Canada typically exceeded a moisture content of 19% and, in most cases, exceeded the fibre saturation moisture content.

CONCLUSIONS: The lack of availability of suitably seasoned framing lumber in Atlantic Canada is a significant contributor to the moisture load in wall systems.

RECOMMENDATIONS: Canada Mortgage and Housing Corporationand the Canadian Home Builders' Association should sponser an initiative to address the lack of reasonable availability of seasoned framing lumber in Atlantic Canada.

Canada Mortgage and Housing Corporation, in consultation with the Canadian Home Builders' Association and building manufacturers, should prepare a practical advisory document for builders addressing: "the advantages of using low-moisture content lumber in housing construction."

The moisture-content survey of framing lumber was not included in the original terms of reference of the Task Force. However, when it became evident that the moisture content of framing lumber could be a more significant factor in the deterioration of walls than was originally understood, the Task Force commissioned a survey of the moisture content of framing lumber in Atlantic Canada. The survey was not intended to be exhaustive. Units for testing were selected at random, with valuable assistance from the local CMHC inspectors to find units at the construction stage desired. The studs and other wood members were then studied in-situ. The question then remains as to whether this situation is a common occurance throughout the Atlantic and if this moisture content varies at different times of the year.

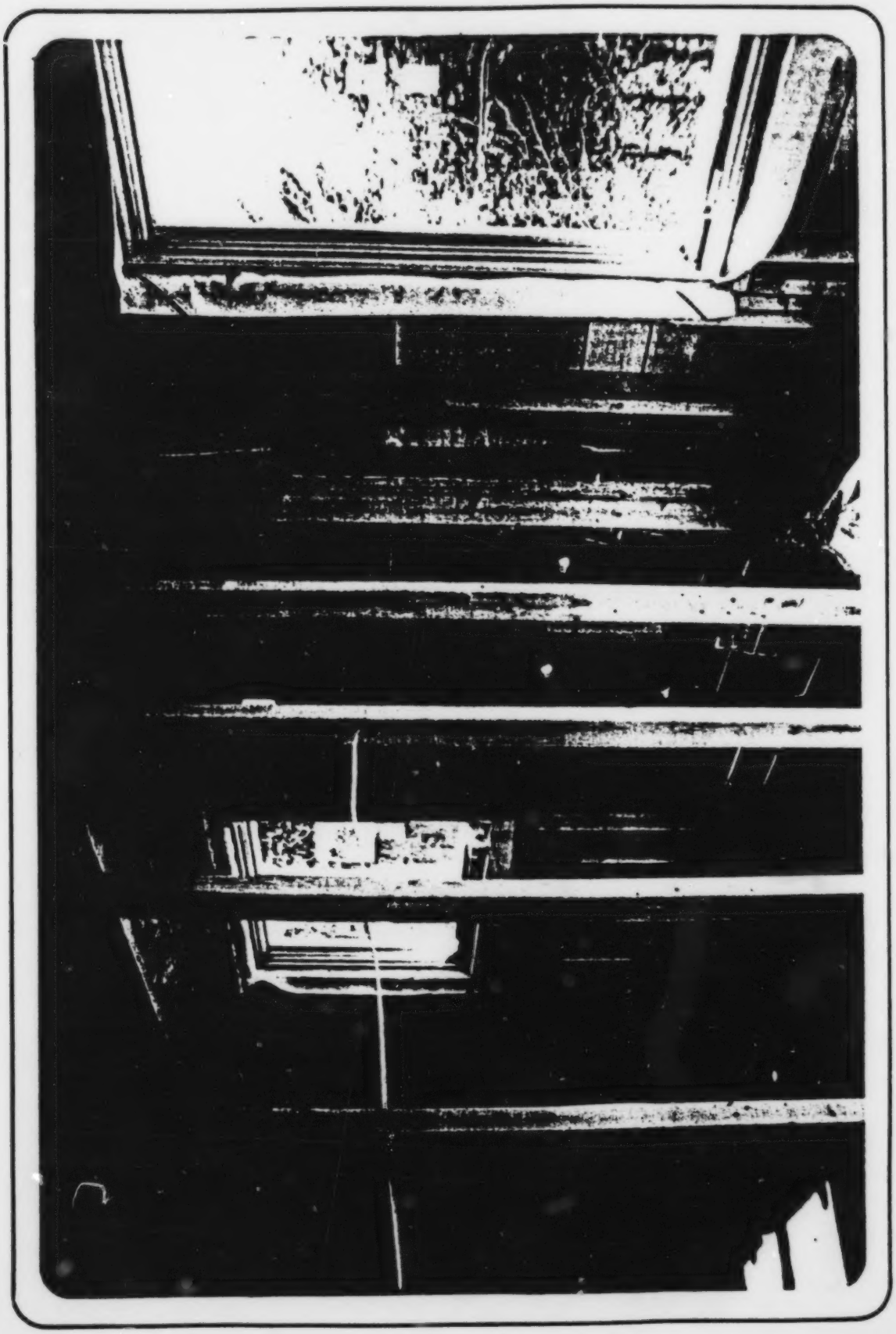
It was decided that on-site testing would be performed. The best time, during the construction, for this testing would be at the vapour barrier installation stage. This testing should also be performed at various times of the year to collect data that might reveal cyclical patterning.

If, during construction the contractor used dry framing lumber and materials as the building code suggests, many problems could be reduced or eliminated and consumer call-backs could be minimized.

2.0 OBJECTIVE OF SURVEY

The objective of the survey was to determine if the use of lumber at a high moisture content could be expected to be encountered in housing construction. A built-in moisture load was part of the experimental design to better show how various wall configurations would cope with moisture--whatever the source. The question of whether the lumber used in construction was likely to be at a high moisture content would, however, have an impact on the direct applicability of Field Research Program results to current building practices.

To determine a method for on-site quantification of wood framing members average moisture contents using a moisture meter. Conduct an initial survey, prior to walls being enclosed, of a significant number of housing units throughout the Atlantic Region and produce a report summarizing findings and making recommendations for futher work, if necssary.



3.0 SURVEY LOCATION

Three surveys were conducted to gather data at various times of the year. The first was undertaken in early November 1986, the second in early January 1987 and the third in early June 1987. Lumber originating from seventeen different sawmills (as indicated by grade stamps), in the vicinities of Saint John, New Brunswick; Halifax, Nova Scotia; St. John's, Newfoundland; and Charlottetown, Prince Edward Island; were surveyed.

4.0 EQUIPMENT AND METHODS

It was determined that each house should have at least one stud tested with the hammer probe on each of the south, east, west and north walls. The studs would be tested at depths of 1/8" (3mm), 3/8" (9mm) and 3/4" (19mm), 6" (150mm) below the top plate and 6" (150mm) above the sill plate. The digital thermometer probe was placed close to the stud, or between the stud and plate if possible, to attain an accurate temperature reading for the correction factor. With the use of the Protimeter a random check of another 8-10 studs at varying heights around the exterior walls would give an overall sample of the moisture levels. If there was a major difference in the readings between studs in the same wall, 3-4 studs were checked to find an average moisture content reading.

Other information collected was the contractors name, lumber supplier, length of time from delivery of lumber to erection, grade stamp sketch, photographs of grade stamp and site, weather conditions, stud size and location and general comments.

For detailed survey sheets, see Appendix 'A' to this report.

Equipment used in the Survey:

- o Protimeter hammer probe w/ 1 1/4" (32 mm) insulated spikes
- o Delmhorst resistance-type moisture meter (see figure 1.)
- o temperature and species correction charts from Forintek Canada Corp.
- o I.M.C. Instruments, Inc. digital thermometer
- o Protimeter Mini moisture meter w/ 1/2" (13 mm) uncoated spikes
- o compass
- o camera

Moisture content was measured using a Delmhorst resistance-type moisture meter with a two-pin hammer probe. The pins were insulated, except at their tips, to minimize the effect of surface moisture on the readings. With resistance-type moisture meter, moisture content is calculated by measuring the resistance of the wood to an electrical current passed between two electrodes (pins) driven into the wood. The higher the moisture content is, the lower will be the resistance to the flow of electrical current. Electrical resistance varies with temperature and wood species so appropriate corrections are made using the Forintek Canada Corp. "Moisture Content Correction Tables for the Resistance-Type Moisture Meter" (revised temperature corrections), August 1984.

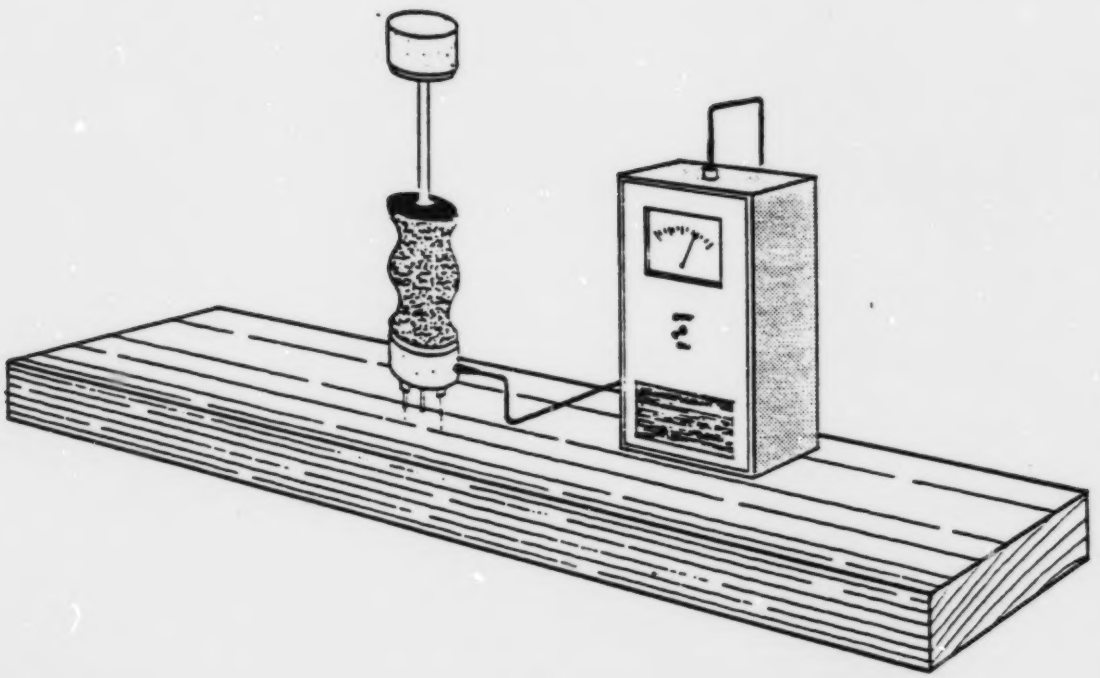


FIGURE 1. Resistance - Type Moisture Meter

Almost all the wood surveyed was grade-stamped as S-P-F or Spruce-Pine-Fir, (S-GRN). "S-GRN" in the grade mark signifies that the lumber was surfaced at a moisture content higher than 19 per cent at a size to allow for natural shrinkage during seasoning. A sawmill representative confirmed that virtually all the framing lumber available in the areas surveyed is spruce with a smaller quantity of fir. Readings taken by moisture meter were checked by a second meter to warn of any malfunction of the apparatus. The meters were calibrated (checked for accuracy) against equipment at Forintek Canada Corp. forest products laboratory.

The error of a reading taken with a resistance-type moisture meter is minimal for readings in the 6 to 25 per cent range. For wood containing in excess of 25 per cent water, the cell walls are saturated and free water begins to fill the cavities within the cells. Resistance readings become unreliable at above 25 per cent and most meters do not read past this point. Above this "fibre-saturation" point, resistance-type moisture meters tend to read low. This means that the actual moisture content is probably higher - sometimes much higher.

5.0 OBSERVATIONS

The data sheets from the moisture content survey are included with this report as Appendix 'A'. In summary, of 110 wall studs measured, representing 17 different sawmills, 90 per cent allowed by the National Building Code of Canada. Some 54 per cent of these were beyond the fibre-saturation point where the moisture meter could only indicate the moisture content was in excess of 30 per cent. Ten per cent of the specimens were at a moisture content of less than 19 per cent.

Reasons for the limited availability of dried lumber in Atlantic Canada are somewhat complex. The single most important factor is the perceived additional cost of supplying air-dried or kiln-dried lumber to a local market area. The cost of kiln-drying for distant markets in the United States can be offset by the reduced cost of transporting drier, lighter lumber. On the demand side, there is a lack of appreciation of the consequences of building with green lumber. Subsequent shrinkage can cause problems with roof truss stability, gypsum board and floor systems, in addition to moisture related damage.

It was noticed during the surveys, that few sawmills or lumber dealers protected finished lumber from the elements during storage, but perhaps most significant was the finding of excessively high moisture content in houses that had been framed for up to two months. This leaves in some doubt the idea that framing lumber, installed and left unclad during winter, will dry in a sufficiently short time to avoid moisture damage.

This survey, while making no claim to be statistically significant, does make it reasonable to suggest that framing lumber may be a significant source of moisture in wall cavities of houses built in Atlantic Canada. This being the case, the saturated lumber used in the test buildings begin to bear a close resemblance to conditions that may occur in a significant number of houses currently being built.

Lumber used in the construction industry can go from "woods to walls" in as little a time span as one day.

Most lumber is graded as S-P-F, S-GRN.

6.0 CONCLUSIONS

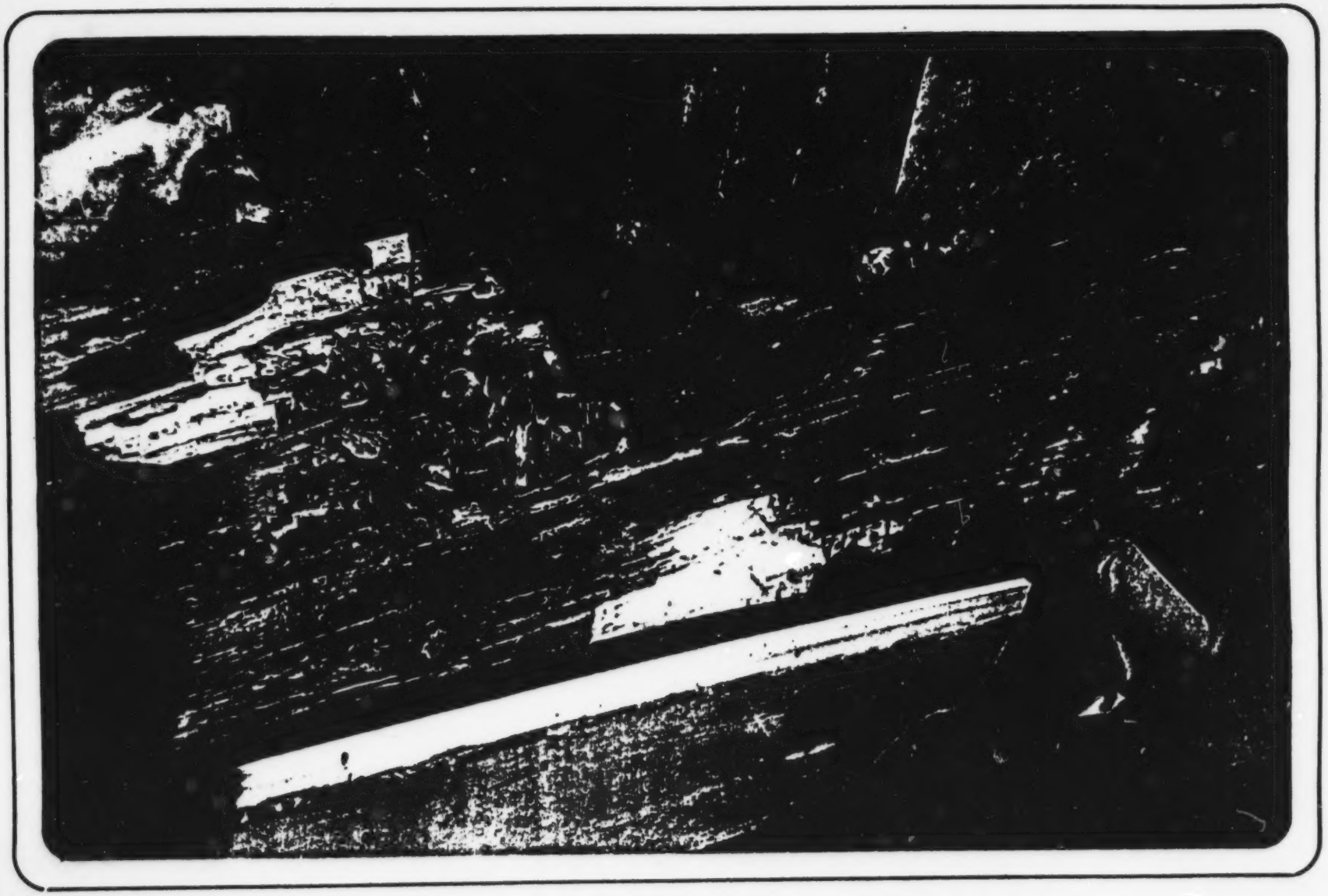
The results of this survey indicate that five of the six houses have the potential for wood deterioration in one or more of the walls tested due to high moisture content levels in the lumber.

Surface molds or sapstain fungi tend to discolour wood surfaces with a black or blue powder-like substance, but do not weaken it. It is not unusual to see surface molds or sapstains on framing lumber in the lumberyards. Spores of surface molds or mildew fungi grow quickly on moist wood or on wood in very humid environments. When the wood dries, fungi die or become dormant, but they do not change their appearance.

When surface molds or sapstain fungi are observed on wood, it should be checked to confirm that the moisture content of the wood is below 20 per cent. If the wood has a higher moisture content than 20 per cent, once temperature corrected, it should be dried before it is used in the house.

The use of exterior sheathing materials with a very low permeability to water vapour in combination with "wet" framing lumber or insulation materials having a high moisture content, puts walls to a high degree of risk of moisture damage.

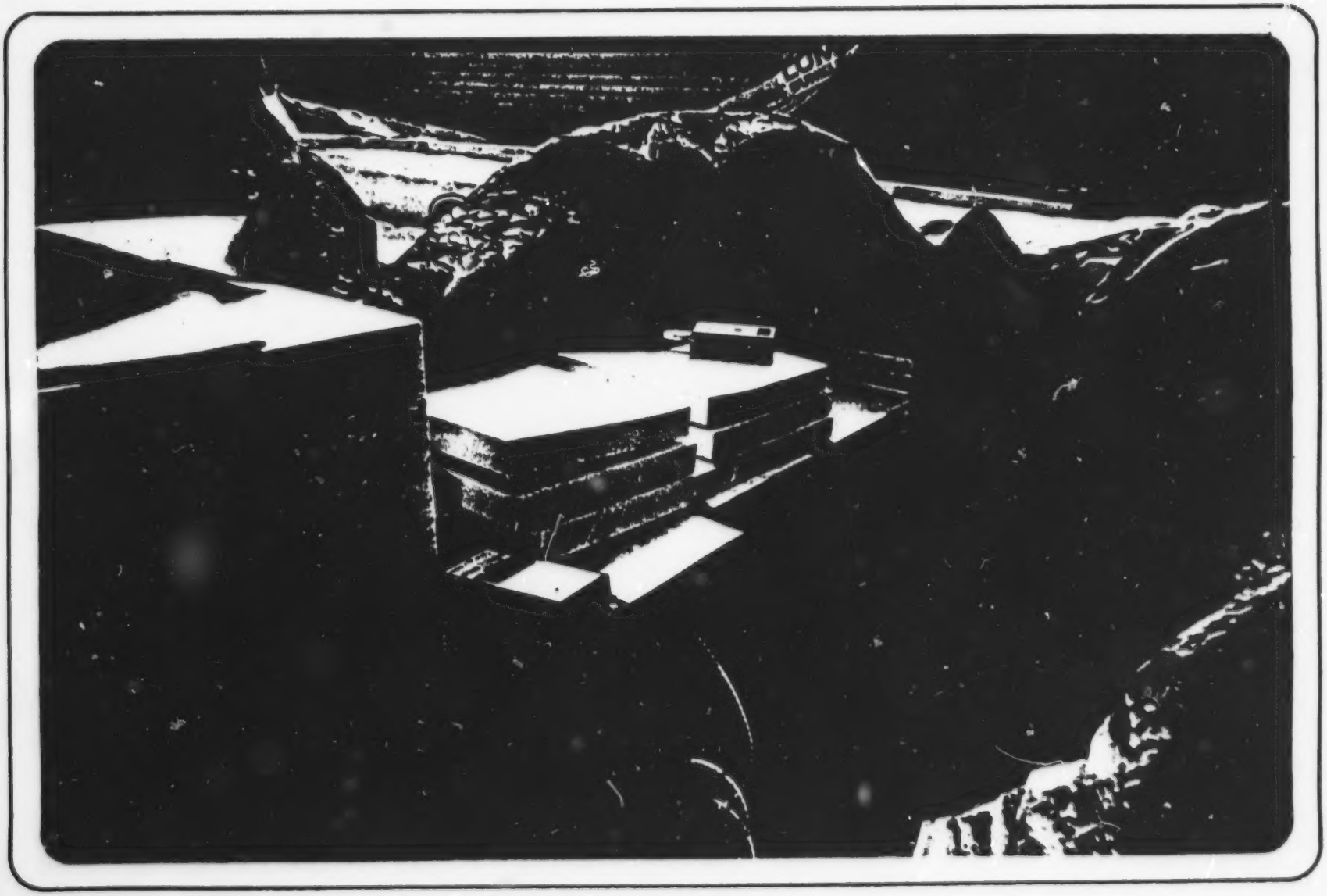
The lack of availability of dry framing lumber is a significant contributor to the moisture load in wall systems.



7.0 RECOMMENDATIONS (FOR FUTURE STUDY)

One of the builders who also owned a small scale local lumber mill suggested that a more appropriate time for this type of survey would be in the late spring or early summer. The reasons for this suggestion was that most of the raw material is harvested during the winter months when the lakes are frozen and milled in the late winter/early spring. The lumber used during the early part of the building season would not have the added time period for yard drying as does lumber used during the later part of the year. If it is neccessary to conduct a similar survey it is recommended that this be done in the early summer or late spring.

This type of survey should also be conducted in other parts of the country and at different times of the year.



8.0 GRAVIMETRIC STUDY

Two "gravimetric" tests of sample studs from this survey were undertaken.To determine moisture content gravimetrically, a stud is weighed before and after oven drying to measure the actual weight of water in the stud. In one stud, the moisture content determined by moisture meter, after temperature and species correction, was 28.8 per cent. The true moisture content, determined gravimetrically, was 28.3 per cent. A second stud had a nearly identical metered moisture content but, upon drying and weighing it was discovered that the true moisture content was over 42 per cent.

9.0 ON-SITE LUMBER (SIDE STUDY)

On January 8, 1987, two pieces of lumber one 2x4x19" long and one 2x6x21" long were taken from a building site in Fredericton, New Brunswick. The unit was one week away from the completion of the framing or closing-in stage. The pieces were in a frozen state at the time of removal. The specimens were individually wrapped in polyethylene and air transported back to Ottawa. By the time of weighing and testing they had been in a room temperature environment for twenty-six hours.

A visual examination of the two specimens was performed. Both pieces were free of defect, no splits etc. It was noted that the 2x6 was pine, cut from the heartwood (inner log), evidenced by the growth rings and the 2x4 was fir, cut from the sapwood (outer log).

A moisture meter was used to test the two pieces. Readings were taken at the top and bottom, in the centre portion of the 4" and 6" dimension, parallel to the grain. Both pieces were then weighed on a mail scale to establish their exact weight.

The 2x6, had a temperature corrected moisture content above 30% and weighed in at 1.835 kg (4.05 lbs). The 2x4, had a temperature corrected moisture content of 25% and weighed in at .790 kg (1.74 lbs). The specimens were left leaning against the wall in an office environment with a temperature of approximately 22 C (71 F), and a relative humidity of 45-50%. Over a three week period the pieces were weighed and metered each week. The results are as listed below:

	2x4		2x6	
DATE	M.C.	Weight	M.C.	Weight
January 9	25%	.790 kg (1.74 lbs)	30%+	1.835 kg (4.05 lbs)
January 16	13-15%	.710 kg (1.57 lbs)	25-30%+	1.360 kg (3.00 lbs)
January 27	10%	.695 kg (1.53 lbs)	13-24%	1.105 kg (2.44 lbs)
April 14	6-7%	.665 kg (1.47 lbs)	6-7%	.995 kg (2.19 lbs)

To draw a comparative analysis, a small size styrofoam coffee cup was filled with water and weighed. It weighed in at .160 kg (.353 lbs). The overall weight loss of the 2x4x19" long was .125 kg (.276 lbs). The overall weight loss of the 2x6x21" long was .840 kg (1.852 lbs). If these pieces had been full length studs, the 2x4 would have lost four (4) cups of water while moving from the original moisture content of 25% to the 7% range. The 2x6 would have lost twenty-four (24) cups to move from the 30%+ moisture content to the 7% range.

In an average 160 sq.M. (1600 sq. ft.) house there are approximately 140 exterior wall studs and if all studs had an equivalent moisture content, the total cups of water the house would lose is appproximately three-thousand, three-hundred and sixty (3360). This amount is equivalent to 544 kg (1200 lbs) or 546 litres (120 gallons) of water. This loss is only accounts for the exterior wall studs and does not include the moisture given off from other sources, such as the concrete, interior partitions, sheathings and other materials.

9.0 LUMBER GRADING AND GRADE STAMPS

Lumber inspection and grading is required by building codes. The grade stamp identifies the lumber grades and species. Lumber design values are affected by two factors: 1) the strength of the particular species; and 2) the strength-affecting characteristics in the individual piece. These characteristics include knots, checks and splits. Quality control in Canadian lumber is maintained by a system of self-regulation, headed up by the Canadian Lumber Standards (CLS) Administrative Board. The grading procedure establishes standards of sizes and quality of lumber.

Most grade stamps, except those for rough lumber or heavy timbers contain five basic elements:

a. Certification mark: This identifies the agency that supervises the inspection at the mill.

b. Mill identification: Firm name, brand, or assigned mill number.

c. Grade designation: Grade name, number or abbreviation.

d. Species identification: Indicates the individual species or species group classification.

e. Condition of seasoning: Indicates moisture content at the time of surfacing: S-DRY - 19 per cent maximum moisture content;
MC 15 - 15 per cent maximum moisture content;
S-GRN - over 19 per cent moisture (unseasoned).

10.0 KILN-DRY AND AIR-DRY LUMBER

The following excerpt on seasoning lumber is taken from a book titled "A TREATISE ON BUILDING CONSTRUCTION" by, The Colliery Engineer Co., Scranton, Pennsylvania and was published in 1900:

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37. The process of evaporating the sap or the drying out of lumber, is effected after it has been sawed into planks, joists, studs, etc., and two methods known respectively as seasoning and kiln-drying are recognized as suitable and efficient for the purpose.

In the first of these, the boards are placed in the open air in large square piles, with narrow strips between the layers; a free circulation thus takes place throughout each pile, and the lumber remains in this position from two to four years, according to its ultimate purpose--two years being adequate for joists, studs, sheathing, and other ordinary framing material, while work intended for trim, doors, sahses, and other products of the joiners skill, should season for four years, or even more, according to the class of material.

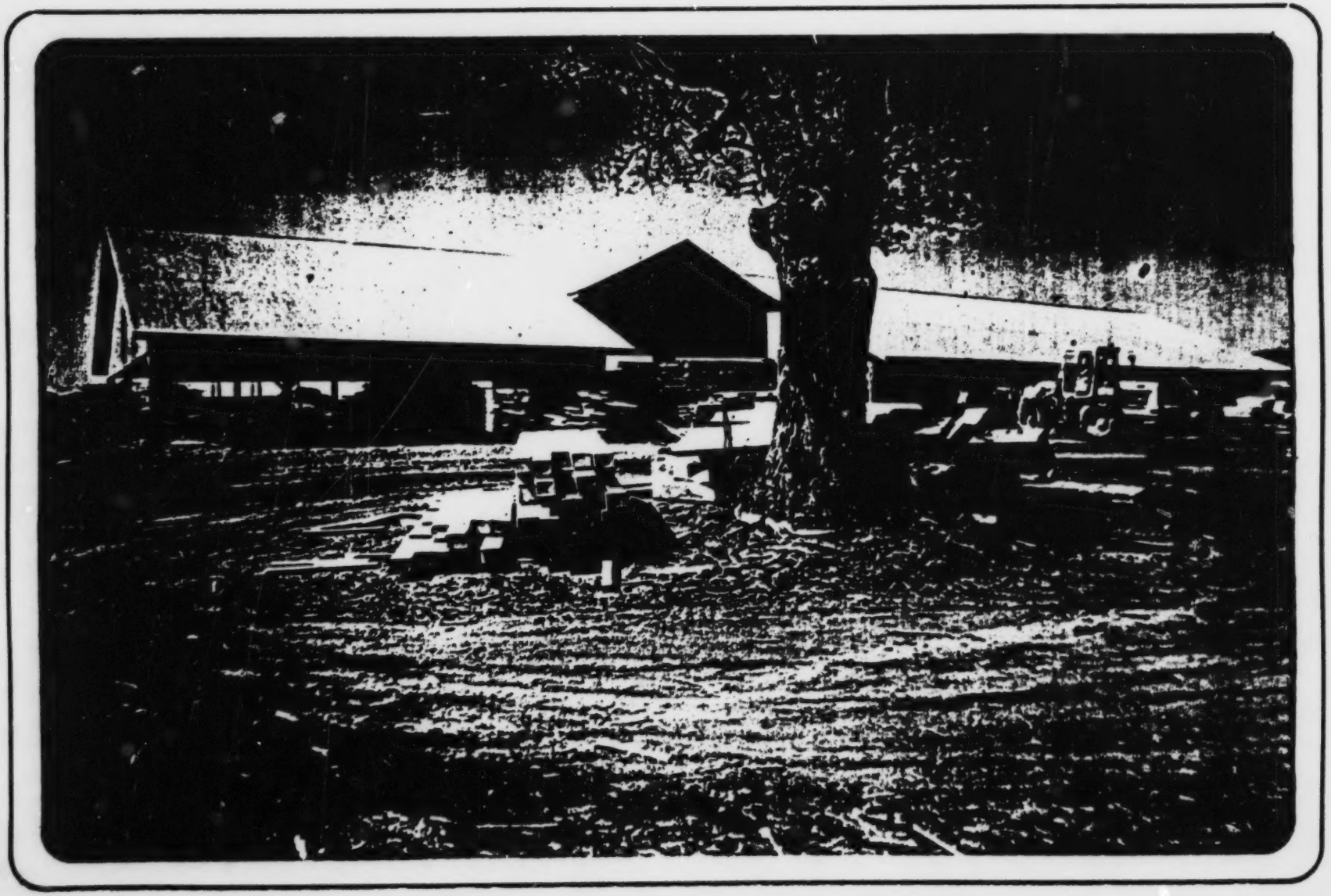
Kiln-drying is effected by piling the lumber as above described, in chambers, or kilns, within which a circulation of air is majntained at a temperature of about 140 degrees F. and at a speed of about 40 miles per hour. Vacuum pumps are used to produce this rapid circulation and to remove the moisture as it evaporates from the boards.

In this manner, lumber not over 2 inches in thickness can be thoroughly dried in about forty-eight hours, which is certainly a great saving of time, but the result is acquired at the expense of a loss of vitality of the material.

38. Kiln-dried lumber lacks the toughness and elasticity retained in the seasoned material, has a greater affinity for atmospheric moisture, and is often subject, especially in the softer woods, to what is known as dry shrinkage--that is, a shrinkage caused by the gradual closing together of the cell walls from which the moisture was evaporated in the kiln, leaving the cell in a vacuous, or hollow, condition. This dry shrinkage does not take place until after the material has been worked, and regardless of teh position of the zones, or annual rings, the wood becomes concave on its freshly cut surface.

The cause of this is that the outside, or surface, tissue of the material is dried first, and thus forms a sort of casing, or crust, which holds the inner fibers in position, and when this surface is removed through the agency of the saw or plane, the interior fibers, being thus relieved of their protecting casing, gradually close on the exposed side and cause the wood to bend, or warp.

This will also occur in weather-seasoned wood which has been placed in one position for a long period and remained uncut or unworked. Thus, the top of an old table will almost invariablt become concave if it is planed off to get a new surface.



Two methods of seasoning are in common use: air, sometimes called natural, and kiln, often called artificial, seasoning, although in commercial practice a combination of the two will often be more satisfactory and economical.

The primary aim in seasoning is to render timber as stable as possible, thereby ensuring that once it is made up into furniture, fittings, etc., movement will be negligible or for practical purposes non-existent; simultaneously, other advantages accrue. Most wood-rotting and all sap-stain fungi can grow in timber only if the moisture content of the wood is above 20 percent: hence, seasoning arrests the development of incipient decay in wood and removes the risk of infection of sound timber. Seasoning does not confer immunity from subsequent infection should the moisture content of previously dry wood be raised above the critical minimum, as a result, for example, of prolonged exposure to damp conditions. Several insect pests can live only in green timber, but others do not appear until wood is at least partially seasoned: those that require timber to be green cease their activity as the wood dries out, and in most cases cannot resume the attack even if the moisture content of the timber should subsequently be raised.

The whole art of successful seasoning lies in maintaining a balance between the evaporation of water from the surface of timber and the movement of water from the intreior of the wood to the surface. Three factors control water movements in wood: the humidity, the rate of circulation, and the temperature of the surrounding air. Temperature has a twofold effect: by influencing the relative humidity of the air it affects the rate of evaporation of water from the surface of the wood, and also within the timber the rate of movement of water from the centre towards the surface.

It is important to appreciate how these three factors interact. The rate of loss of moisture from wood depends on the humidity of the air in immediate contact with the surface layers, and on the dryness of the layers themselves. The rate of movement of water outwards in a piece of wood depends on the vapour pressure of successive layers not being excessive. If the outer layers are appreciably drier than the interior, greater resistance is offered to the movement of moisture outwards than when differences in vapour pressure, and consequently in moisture content, of successive layers are smaller; in extreme circumstances resistance may be such that diffusion of moisture from the inner layers outwards is brought to a standstill, the moisture in the interior of the wood being sealed in. Resumption of moisture movements in such cases can usually be achieved only by artificial means, e.g. steaming in a kiln. The relative humidity in the atmosphere, and its temperature, are all important in the seasoning process: the lower the relative humidity of the air the better will it be able to take up moisture from the surface of a piece of wood, and, conversely, wood in contact with saturated air cannot dry at all; alternatively, high temperatures can explain the drying power of the atmosphere, although its relative humidity is high.

AIR-SEASONING

Air seasoning aims at making the best use of prevailing winds and the sun, while protecting timber from rain. Wind by circulating the air, prevents it from becoming saturated with moisture absorbed from seasoning timber, and the sun, by raising the temperature of the air, lowers its relative humidity. The combined effect of these two factors is to maintain the drying power of the air.

KILN-SEASONING

Kiln dryuing is effected in a closed chamber, providing maximum control of air circulation, humidity, and temperature. In consequence, drying can be regulated so that shrinkage occurs with the minimum of degrade, and lower moisture contents can be reached than are possible with air seasoning. The great advantages of kiln seasoning are its rapidity, adaptability, and precision. It also ensures a dependable supply of seasoned timber at any season of the year; and it is the only way that timber can be conditioned for interior use requiring lower equilibrium moisture contents than those prevailing out-of-doors, or in unheated sheds. However, departure from the recommended levels of temperature and relative humidity can give rise to drying degrade and in extreme cases, gross errors in operation can result in the load of timber being seriously damaged.

In the past, standard drying schedules have often been employed, irrespective of the species, dimensions, or conditions of the timber to be seasoned, and, too often, kilns have been little better than hot ovens. In such circumstances kiln drying can be thoroughly unsatisfactory, resulting in serious damage to the timber. If properly carried out, kiln seasoning is not only as successful as air seasoning, but in many respects is superior. For reasons of economy, it is common practice to air dry timber initially, and to complete drying to the required final moisture content in a kiln. Provided air drying is done properly, the combination of air and kiln drying is not open to any objections, and should prove much more economical than kiln drying from green.

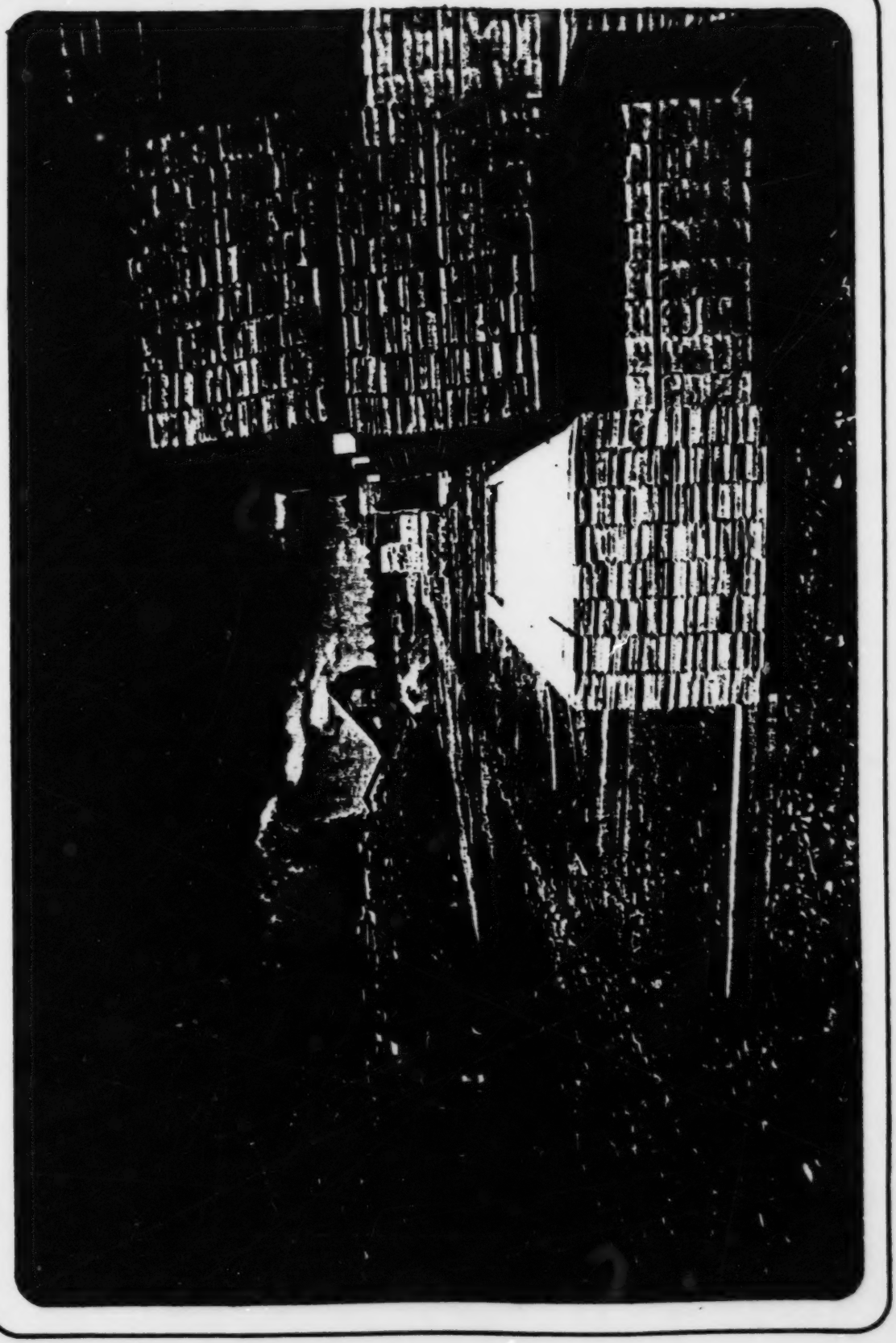


TABLE 1: SUMMARY OF MOISTURE CONTENT READINGS

Moisture Contents (av./stud)		15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30+
Month	Unit																
	1 Nf										*				***	* ***	
	2 Nf							****		**	**						
Nov.	3 Nf							***		*	*						***
14-20	4 NB															********	
	5 NB						*		*****	*						*	
	6 NS															********	
	7 NB															********	
	8 NB										**	*				***	
Jan.	9 NB															** **	
6-7	10 NS												**	***	*	**	
	11 NS				*				***		*		*				
	12 NS												*	*			*
	13 NS									*	*			*****		*	
	14 Nf							*	***				**				
	15 Nf				*				*				*				*
	16 Nf							**	*					*	*		
June	17 Nf							**					*	*			***
1-4	18 Nf							****						*	*		*
	19 NS						**	*			**						****
	20 NB						*						*			****	
	21 NB						**	**								**	
	22PEI						****									*	
146 readings					2		10	19	13	5	10	1	9	12	7	23	35
% of total					1		7	13	9	3	7	1	6	8	4	16	25
% of category				1					39						59		

NOTE: These readings were all taken in units that had been framed for 4 weeks or less and were at the vapour barrier/insulation stage.

APPENDIX 'A'

Moisture Survey Sheets

WOOD FRAMING MOISTURE STUDY

LOCATION: ST. JOHN'S, NEWFOUNDLAND DATE: NOVEMBER 14, 1986

CONTRACTOR NAME: HOUSE #1

LUMBER SUPPLIER: LOCAL (NEWFOUNDLAND)

LENGTH OF TIME FROM DELIVERY TO ERECTION: SAME DAY

ILLUSTRATE GRADE STAMP:

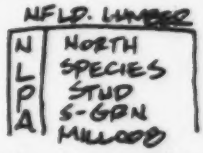


PHOTO NO. OF STAMP: 5-8

WEATHER CONDITIONS: -3°C W/110 KM/HR WINDS (SUNNY PERIODS)

PHOTO NO. OF SITE: 9 & 10

STUD # 1: SIZE & LOCATION: 2x6 WEST WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	-1°C	24	24
3/8"TOP:	15	-1°C	24	
3/4"TOP:				
1/8"BOTT:	15	-1°C	24	29
3/8"BOTT:	19	-1°C	30	
3/4"BOTT:				
HEADER:				

STUD # 2: SIZE & LOCATION: 2x6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	13	-1°C	21	28
3/8"TOP:	19	-1°C	30	
3/4"TOP:				
1/8"BOTT:	22	-1°C	30+	30+
3/8"BOTT:	25	-1°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 3: SIZE & LOCATION: 2x6 EAST WALL

	MC	T	MC/T	AV.
1/8"TOP:	19	-1°C	30	30+
3/8"TOP:	22	-1°C	30+	
3/4"TOP:				
1/8"BOTT:	19	-1°C	30	30+
3/8"BOTT:	22	-1°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 4: SIZE & LOCATION: 2x6 SOUTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	13	-1°C	21	28
3/8"TOP:	19	-1°C	30	
3/4"TOP:				
1/8"BOTT:	13	-1°C	21	28
3/8"BOTT:	19	-1°C	30	
3/4"BOTT:				
HEADER:				

GENERAL COMMENTS: HAS BEEN WORKING ON HOUSE FOR 3 WEEKS. WILL INSTALL VAPOUR BARRIER IN 2 WEEKS.

WOOD FRAMING MOISTURE STUDY

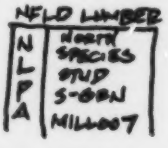
LOCATION: ST. JOHN'S, NEWFOUNDLAND DATE: NOVEMBER 14, 1986

CONTRACTOR NAME: HOUSE #2

LUMBER SUPPLIER: LOCAL (NEWFOUNDLAND)

LENGTH OF TIME FROM DELIVERY TO ERECTION:

ILLUSTRATE GRADE STAMP:



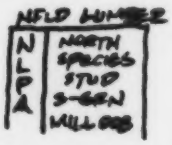


PHOTO NO. OF STAMP: 11 & 12

WEATHER CONDITIONS: -5°C W/110 KM/HR WIND (SUNNY PERIODS)

PHOTO NO. OF SITE: 13-16

STUD # 1: SIZE & LOCATION: 2x6 EAST WALL

	MC	T	MC/T	AV.
1/8"TOP:	13	-2°C	21	21
3/8"TOP:	13	-2°C	21	
3/4"TOP:				
1/8"BOTT:	13	-2°C	21	21
3/8"BOTT:	13	-2°C	21	
3/4"BOTT:				
HEADER:				

STUD # 2: SIZE & LOCATION: 2x6 SOUTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	-2°C	24	24
3/8"TOP:	15	-2°C	24	
3/4"TOP:				
1/8"BOTT:	13	-2°C	21	21
3/8"BOTT:	13	-2°C	21	
3/4"BOTT:				
HEADER:				

STUD # 3: SIZE & LOCATION: 2x6 WEST WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	-2°C	21	23
3/8"TOP:	15	-2°C	24	
3/4"TOP:				
1/8"BOTT:	13	-2°C	21	21
3/8"BOTT:	13	-2°C	21	
3/4"BOTT:				
HEADER:				

STUD # 4: SIZE & LOCATION: 2x6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	-2°C	24	24
3/8"TOP:	15	-2°C	24	
3/4"TOP:				
1/8"BOTT:	13	-2°C	21	23
3/8"BOTT:	15	-2°C	24	
3/4"BOTT:				
HEADER:				

GENERAL COMMENTS: HAS BEEN FRAMED FOR 6 WEEKS

WOOD FRAMING MOISTURE STUDY

LOCATION: ST. JOHN'S, NEWFOUNDLAND DATE: NOVEMBER 14, 1986

CONTRACTOR NAME: UNIT #3

LUMBER SUPPLIER: LOCAL (NEWFOUNDLAND)

LENGTH OF TIME FROM DELIVERY TO ERECTION: APPROX. 1 WEEK

ILLUSTRATE GRADE STAMP:

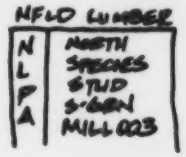


PHOTO NO. OF STAMP: 17 & 18

WEATHER CONDITIONS: -5°C W/ 110 KM/HR WIND (SUNNY PERIODS)

PHOTO NO. OF SITE: 19

STUD # 1: SIZE & LOCATION: 2X6 WEST WALL

	MC	T	MC/T	AV.
1/8"TOP:	13	-1°C	21	21
3/8"TOP:	13	-1°C	21	
3/4"TOP:				
1/8"BOTT:	13	-1°C	21	21
3/8"BOTT:	13	-1°C	21	
3/4"BOTT:				
HEADER:				

STUD # 2: SIZE & LOCATION: 2X6 SOUTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	13	-1°C	21	23
3/8"TOP:	15	-1°C	24	
3/4"TOP:				
1/8"BOTT:	15	-1°C	24	24
3/8"BOTT:	13	-1°C	24	
3/4"BOTT:				
HEADER:				

STUD # 3: SIZE & LOCATION: 2X6 NORTH WALL (UPPER LEVEL OF SPLIT)

	MC	T	MC/T	AV.
1/8"TOP:	13	-1°C	21	21
3/8"TOP:	13	-1°C	21	
3/4"TOP:				
1/8"BOTT:	19	-1°C	30	30+
3/8"BOTT:	30+	-1°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 4: SIZE & LOCATION: 2X6 NORTH WALL (BASEMENT OF SPLIT)

	MC	T	MC/T	AV.
1/8"TOP:	30+	-1°C	30+	30+
3/8"TOP:	30+	-1°C	30+	
3/4"TOP:				
1/8"BOTT:	22	-1°C	30+	30+
3/8"BOTT:	22	-1°C	30+	
3/4"BOTT:				
HEADER:				

GENERAL COMMENTS: HAS BEEN FRAMED FOR 5 WEEKS. BUILDER ALSO OWNS A SMALL MILL AND STATED THAT MOST LOGS ARE CUT IN WINTER WHILE LAKES ARE FROZEN. IT IS THEN MILLED IN THE SPRING AND STACKED. A TEST OF THIS KIND WOULD BE BETTER PERFORMED IN THE LATE SPRING.

WOOD FRAMING MOISTURE STUDY

LOCATION: FREDERICTON, NEW BRUNSWICK DATE: NOVEMBER 17, 1986

CONTRACTOR NAME: HOUSE #4

LUMBER SUPPLIER: LOCAL (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION: APPROX. 2 DAYS

ILLUSTRATE GRADE STAMP:
NOTE: THERE WAS NO STAMP ON ANY EXTERIOR WALL STUDS, ONLY ON THE SILL PLATE.

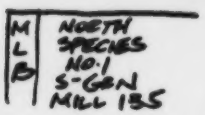


PHOTO NO. OF STAMP: 22

WEATHER CONDITIONS: +1°C AND OVERCAST

PHOTO NO. OF SITE: 23-25

STUD # 1: SIZE & LOCATION: 2x6 NORTH-WEST WALL

	MC	T	MC/T	AV.
1/8"TOP:	22	+2°C	30+	30+
3/8"TOP:	30+	+2°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	25	+2°C	30+	30+
3/8"BOTT:	30+	+2°C	30+	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: 2x6 NORTH-EAST WALL

	MC	T	MC/T	AV.
1/8"TOP:	19	+2°C	30	30+
3/8"TOP:	22	+2°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	15	+2°C	24	29
3/8"BOTT:	19	+2°C	30	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: 2x6 SOUTH-EAST WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	+2°C	24	29
3/8"TOP:	19	+2°C	30	
3/4"TOP:	___	___	___	
1/8"BOTT:	15	+2°C	24	29
3/8"BOTT:	19	+2°C	30	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: 2x6 SOUTH-WEST WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	+2°C	24	29
3/8"TOP:	19	+2°C	30	
3/4"TOP:	___	___	___	
1/8"BOTT:	15	+2°C	24	29
3/8"BOTT:	19	+2°C	30	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS: R2000 HOUSE. HAS BEEN FRAMED FOR 1½ WEEKS. WILL INSTALL VAPOUR BARRIER IN 1½ WEEKS.
1x6 BOARD SHEATHING IS AT 30+% MOISTURE CONTENT AT CORE.

WOOD FRAMING MOISTURE STUDY

LOCATION: BERESFORD, NEW BRUNSWICK DATE: NOVEMBER 18, 1986

CONTRACTOR NAME: HOUSE #5

LUMBER SUPPLIER: LOCAL (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION: SAME DAY

ILLUSTRATE GRADE STAMP: M L B | S-P-F NO.1 S-GRN MILL 131

PHOTO NO. OF STAMP: 2&3

WEATHER CONDITIONS: -1°C SUNNY W/ CLOUDY PERIODS

PHOTO NO. OF SITE: 4

STUD # 1: SIZE & LOCATION: 2X6 NORTH KNEE-WALL (BASEMENT)

	MC	T	MC/T	AV.
1/8"TOP:	15	+4°C	23	
3/8"TOP:	15	+4°C	23	23
3/4"TOP:	—	—	—	
1/8"BOTT:	15	+4°C	23	
3/8"BOTT:	19	+4°C	29	28
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

STUD # 2: SIZE & LOCATION: 2X6 SOUTH KNEE-WALL (BASEMENT)

	MC	T	MC/T	AV.
1/8"TOP:	13	+4°C	20	
3/8"TOP:	13	+4°C	20	20
3/4"TOP:	—	—	—	
1/8"BOTT:	13	+4°C	20	
3/8"BOTT:	15	+4°C	23	22
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

STUD # 3: SIZE & LOCATION: 2X6 EAST KNEE-WALL (BASEMENT)

	MC	T	MC/T	AV.
1/8"TOP:	13	+4°C	20	
3/8"TOP:	15	+4°C	23	22
3/4"TOP:	—	—	—	
1/8"BOTT:	13	+4°C	20	
3/8"BOTT:	15	+4°C	23	22
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

STUD # 4: SIZE & LOCATION: 2X6 WEST KNEE-WALL (BASEMENT)

	MC	T	MC/T	AV.
1/8"TOP:	13	+4°C	20	
3/8"TOP:	15	+4°C	23	22
3/4"TOP:	—	—	—	
1/8"BOTT:	13	+4°C	20	
3/8"BOTT:	15	+4°C	23	22
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

GENERAL COMMENTS: R2000 HOUSE. HAS BEEN FRAMED FOR 2 WEEKS. POLE-FRAME CONSTRUCTION WITH VAPOUR BARRIER BETWEEN. HAS USED ELECTRIC HEATERS FOR 1½ WEEKS ON BOTH FLOORS.

WOOD FRAMING MOISTURE STUDY

LOCATION: EAST PRESTON DATE: NOVEMBER 20, 1986

CONTRACTOR NAME: HOUSE #6 (OWNER BUILT)

LUMBER SUPPLIER: LOCAL PREFABRICATION PLANT

LENGTH OF TIME FROM DELIVERY TO ERECTION: 2 DAYS

ILLUSTRATE GRADE STAMP: NO GRADE STAMP PHOTO NO. OF STAMP: _____

WEATHER CONDITIONS: -1°C W/ 12" OF SNOW (SUNNY PERIODS) PHOTO NO. OF SITE: _____

STUD # 1: SIZE & LOCATION: 2X6 WEST WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	-1°C	24	29
3/8"TOP:	19	-1°C	30	
3/4"TOP:				
1/8"BOTT:	15	-1°C	24	29
3/8"BOTT:	19	-1°C	30	
3/4"BOTT:				
HEADER:				

STUD # 2: SIZE & LOCATION: 2X6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	19	-1°C	30	30+
3/8"TOP:	22	-1°C	30+	
3/4"TOP:				
1/8"BOTT:	19	-1°C	30	30+
3/8"BOTT:	22	-1°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 3: SIZE & LOCATION: 2X6 SOUTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	19	-1°C	30	30
3/8"TOP:	19	-1°C	30	
3/4"TOP:				
1/8"BOTT:	19	-1°C	30	30
3/8"BOTT:	19	-1°C	30	
3/4"BOTT:				
HEADER:				

STUD # 4: SIZE & LOCATION: 2X6 EAST WALL

	MC	T	MC/T	AV.
1/8"TOP:	19	-1°C	30	30
3/8"TOP:	19	-1°C	30	
3/4"TOP:				
1/8"BOTT:	19	-1°C	30	30
3/8"BOTT:	19	-1°C	30	
3/4"BOTT:				
HEADER:				

GENERAL COMMENTS: HAS BEEN FRAMED FOR 3 WEEKS. WILL INSTALL VAPOUR BARRIER IN 1 WEEK. MOISTURE CONTENT OF SHEATHING IS 30+% AND STUDS AT 30+% M.C.

WOOD FRAMING MOISTURE STUDY

LOCATION: QUISPAMSIS, NEW BRUNSWICK DATE: JANUARY 6, 1987

CONTRACTOR NAME: LUMBER COMPANY

LUMBER SUPPLIER: LOCAL (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION: _____

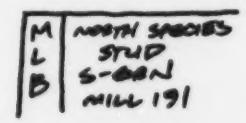
ILLUSTRATE GRADE STAMP: 

PHOTO NO. OF STAMP: 3 & 4

WEATHER CONDITIONS: -4°C AND SUNNY

PHOTO NO. OF SITE: _____

STUD # 1: SIZE & LOCATION:

2X4 TOP OF PILE (NO-WRAP SNOW COVERED)

STAMP	MC	T	MC/T	AV.
1/8"TOP:	19	-8°C	30+	30+
3/8"TOP:	19	-8°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	19	-8°C	30+	30+
3/8"BOTT:	19	-8°C	30+	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION:

2X4 MIDDLE OF PILE (NO-WRAP SNOW COVERED)

STAMP	MC	T	MC/T	AV.
1/8"TOP:	19	-8°C	30+	30+
3/8"TOP:	19	-8°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	19	-8°C	30+	30+
3/8"BOTT:	19	-8°C	30+	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION:

2X4 TOP OF PILE (NO WRAP SNOW COVERED)

NO STAMP	MC	T	MC/T	AV.
1/8"TOP:	19	-8°C	30+	30+
3/8"TOP:	19	-8°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	19	-8°C	30+	30+
3/8"BOTT:	19	-8°C	30+	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION:

2X4 MIDDLE OF PILE (NO WRAP SNOW COVERED)

NO STAMP	MC	T	MC/T	AV.
1/8"TOP:	19	-8°C	30+	30+
3/8"TOP:	19	-8°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	19	-8°C	30+	30+
3/8"BOTT:	19	-8°C	30+	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS: MOST 2X6 AND 2X8 STOCK WAS AT 19% (30+) MOISTURE CONTENT.

WOOD FRAMING MOISTURE STUDY

LOCATION: SAINT JOHN, NEW BRUNSWICK DATE: JANUARY 6, 1987

CONTRACTOR NAME: MILL (SMALL)

LUMBER SUPPLIER: MILL IN CHIPMAN, NEW BRUNSWICK

LENGTH OF TIME FROM DELIVERY TO ERECTION:

ILLUSTRATE GRADE STAMP:

M L B	S-P-F NO. 1 S-GRN MILL 700

PHOTO NO. OF STAMP: 142

WEATHER CONDITIONS: -5°C AND SUNNY

PHOTO NO. OF SITE:

STUD # 1: SIZE & LOCATION:

2×4 TOP OF PILE SHELTERED/NO HEAT

	MC	T	MC/T	AV.
1/8"TOP:	19	-2°C	30	30
3/8"TOP:	19	-2°C	30	
3/4"TOP:				
1/8"BOTT:	19	-2°C	30	30
3/8"BOTT:	19	-2°C	30	
3/4"BOTT:				
HEADER:				

STUD # 2: SIZE & LOCATION:

2×4 MIDDLE OF PILE SHELTERED/NO HEAT

	MC	T	MC/T	AV.
1/8"TOP:	19	-2°C	30	30+
3/8"TOP:	22	-2°C	30+	
3/4"TOP:				
1/8"BOTT:	19	-2°C	30	30+
3/8"BOTT:	22	-2°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 3: SIZE & LOCATION:

2×4 TOP OF PILE UNSHELTERED/NO HEAP/SNOW COVER

	MC	T	MC/T	AV.
1/8"TOP:	22	-7°C	30+	30+
3/8"TOP:	22	-7°C	30+	
3/4"TOP:				
1/8"BOTT:	22	-7°C	30+	30+
3/8"BOTT:	22	-7°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 4: SIZE & LOCATION:

2×4 MIDDLE OF PILE UNSHELTERED/NO HEAP/SNOW COVER

	MC	T	MC/T	AV.
1/8"TOP:	19	-7°C	30+	30+
3/8"TOP:	19	-7°C	30+	
3/4"TOP:				
1/8"BOTT:	19	-7°C	30+	30+
3/8"BOTT:	19	-7°C	30+	
3/4"BOTT:				
HEADER:				

GENERAL COMMENTS: SPECIALTY MILL. LUMBER IN YARD SINCE DECEMBER 20, 1986. WAS MILLED ON DECEMBER 17, 1986. THEY DO NOT SELL VERY MUCH FRAMING LUMBER. SELLS 120,000 BD. FT. OF SPRUCE FOR EVERY 20,000 BD. FT. OF BRITISH COLUMBIA PINE.

WOOD FRAMING MOISTURE STUDY

LOCATION: QUISPAMSIS, NEW BRUNSWICK DATE: JANUARY 6, 1987

CONTRACTOR NAME: HOUSE #7

LUMBER SUPPLIER: LOCAL (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION: 2 DAYS

ILLUSTRATE GRADE STAMP: CL@A S-P-F 702 NO.2 S-GRN

PHOTO NO. OF STAMP: 546

WEATHER CONDITIONS: -4°C AND SUNNY

PHOTO NO. OF SITE:

STUD # 1: SIZE & LOCATION: 2x6 EAST WALL

	MC	T	MC/T	AV.
1/8"TOP:	19	-3°C	30+	30+
3/8"TOP:	22	-3°C	30+	
3/4"TOP:				
1/8"BOTT:	19	-3°C	30+	30+
3/8"BOTT:	19	-3°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 2: SIZE & LOCATION: 2x6 SOUTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	22	-3°C	30+	30+
3/8"TOP:	19	-3°C	30+	
3/4"TOP:				
1/8"BOTT:	19	-3°C	30+	30+
3/8"BOTT:	19	-3°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 3: SIZE & LOCATION: 2x6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	19	-3°C	30+	30+
3/8"TOP:	19	-3°C	30+	
3/4"TOP:				
1/8"BOTT:	19	-3°C	30+	30+
3/8"BOTT:	19	-3°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 4: SIZE & LOCATION: 2x6 WEST WALL

	MC	T	MC/T	AV.
1/8"TOP:	22	-3°C	30+	30+
3/8"TOP:	22	-3°C	30+	
3/4"TOP:				
1/8"BOTT:	22	-3°C	30+	30+
3/8"BOTT:	22	-3°C	30+	
3/4"BOTT:				
HEADER:				

GENERAL COMMENTS: HOUSE IS AT FRAMING STAGE. 2 WEEKS FROM CLOSING-IN. ALL WOOD IN GARAGE IS 19% MOISTURE CONTENT (30+%)

S-P-F No.2 S-GRN

WOOD FRAMING MOISTURE STUDY

LOCATION: QUISPAMSIS, NEW BRUNSWICK DATE: JANUARY 6, 1987

CONTRACTOR NAME: COMPLETED HOUSE (SITTING FOR 6 MONTHS)

LUMBER SUPPLIER: LOCAL (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION: _____

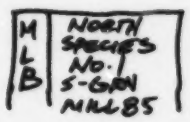
ILLUSTRATE GRADE STAMP: 

PHOTO NO. OF STAMP: 7

WEATHER CONDITIONS: -4°C AND SUNNY

PHOTO NO. OF SITE: _____

STUD # 1: SIZE & LOCATION: 2X6 SOUTH KNEE-WALL (BASEMENT)

	MC	T	MC/T	AV.
1/8"TOP:	10	+7°C	15	15
3/8"TOP:	10	+7°C	15	
3/4"TOP:				
1/8"BOTT:	10	+7°C	15	15
3/8"BOTT:	10	+7°C	15	
3/4"BOTT:				
HEADER:				

STUD # 2: SIZE & LOCATION: 2X6 WEST KNEE-WALL (BASEMENT)

	MC	T	MC/T	AV.
1/8"TOP:	10	+7°C	15	15
3/8"TOP:	10	+7°C	15	
3/4"TOP:				
1/8"BOTT:	10	+7°C	15	15
3/8"BOTT:	10	+7°C	15	
3/4"BOTT:				
HEADER:				

STUD # 3: SIZE & LOCATION: _____

	MC	T	MC/T	AV.
1/8"TOP:				
3/8"TOP:				
3/4"TOP:				
1/8"BOTT:				
3/8"BOTT:				
3/4"BOTT:				
HEADER:				

STUD # 4: SIZE & LOCATION: _____

	MC	T	MC/T	AV.
1/8"TOP:				
3/8"TOP:				
3/4"TOP:				
1/8"BOTT:				
3/8"BOTT:				
3/4"BOTT:				
HEADER:				

GENERAL COMMENTS: METER READINGS TAKEN IN BASEMENT KNEE WALL. HOUSE HAS BEEN COMPLETED FOR 6 MONTHS AND IS UN-OCCUPIED. 1X6 BOARD SHEATHING AT 8% MOISTURE CONTENT.

WOOD FRAMING MOISTURE STUDY

LOCATION: EAST RIVERSIDE/MEMRAMCOOK N.B. DATE: JANUARY 6, 1987

CONTRACTOR NAME: HOUSE #8

LUMBER SUPPLIER: LOCAL (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION:

ILLUSTRATE GRADE STAMP:

M	NORTH SPECIES
L	NO. 1
B	S-GRN
	MILL 2

PHOTO NO. OF STAMP: 8

WEATHER CONDITIONS: -4°C AND SUNNY

PHOTO NO. OF SITE:

STUD # 1: SIZE & LOCATION: 2x6 SOUTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	13	-3°C	22	24
3/8"TOP:	15	-3°C	25	
3/4"TOP:				
1/8"BOTT:	13	-3°C	22	24
3/8"BOTT:	15	-3°C	25	
3/4"BOTT:				
HEADER:				

STUD # 2: SIZE & LOCATION: 2x6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	-3°C	25	29
3/8"TOP:	19	-3°C	30+	
3/4"TOP:				
1/8"BOTT:	15	-3°C	25	29
3/8"BOTT:	19	-3°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 3: SIZE & LOCATION: 2x6 EAST WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	-3°C	25	25
3/8"TOP:	15	-3°C	25	
3/4"TOP:				
1/8"BOTT:	15	-3°C	25	29
3/8"BOTT:	19	-3°C	30+	
3/4"BOTT:				
HEADER:				

STUD # 4: SIZE & LOCATION:

	MC	T	MC/T	AV.
1/8"TOP:				
3/8"TOP:				
3/4"TOP:				
1/8"BOTT:				
3/8"BOTT:				
3/4"BOTT:				
HEADER:				

GENERAL COMMENTS: ALMOST ALL SPOT CHECK METER READINGS WERE AT 19% M.C. GRADE STAMP ON 2x4 INTERIOR STUDS METERED AT 28% (30+) MOISTURE CONTENT.

M	NORTH SPECIES
L	SPF
B	S-GRN
	MILL 191

WOOD FRAMING MOISTURE STUDY

LOCATION: GRAND BAY, NEW BRUNSWICK DATE: JANUARY 7, 1987

CONTRACTOR NAME: MILL (NO KILN)

LUMBER SUPPLIER: DIFFERENT SOURCES

LENGTH OF TIME FROM DELIVERY TO ERECTION: _____

ILLUSTRATE GRADE STAMP: M L B | NORTH SPECIES STUD S-GRN MILL ISL

PHOTO NO. OF STAMP: 9

WEATHER CONDITIONS: +4°C RAINING AND OVERCAST

PHOTO NO. OF SITE: 10

STUD # 1: SIZE & LOCATION:

2x6 TOP OF PILE (UNCOVERED)

STAMP	MC	T	MC/T	AV.
1/8"TOP:	22	+5°C	30+	30
3/8"TOP:	19	+5°C	29	
3/4"TOP:	___	___	___	
1/8"BOTT:	22	+5°C	30+	30
3/8"BOTT:	19	+5°C	29	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION:

2x6 MIDDLE OF PILE (UNCOVERED)

STAMP	MC	T	MC/T	AV.
1/8"TOP:	22	-1°C	30+	30+
3/8"TOP:	22	-1°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	22	-1°C	30+	30+
3/8"BOTT:	22	-1°C	30+	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION:

TOP OF PILE
2x10 ROUGH SAWN / STICK RACKED

NO STAMP	MC	T	MC/T	AV.
1/8"TOP:	22	+4°C	30+	30+
3/8"TOP:	22	+4°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION:

MIDDLE OF PILE
2x10 ROUGH SAWN / STICK RACKED

NO STAMP	MC	T	MC/T	AV.
1/8"TOP:	22	+4°C	30+	30+
3/8"TOP:	22	+4°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS: ALL LOGS CAME IN OCT/NOV/DEC 86 2/3 SPRUCE AND MILLED IN MAY/JUNE
METERED LOGS FROM NOV. 86: 15-19% HEARTWOOD / 22-30% SAPWOOD.
METERED 1X6 PINE BOARDS / STICK RACKED FROM 1 YEAR AGO: 15% @ +4°C OUTDOOR TEMP.

WOOD FRAMING MOISTURE STUDY

LOCATION: GONDOLA POINT, NEW BRUNSWICK DATE: JANUARY 7, 1987

CONTRACTOR NAME: COMPLETED HOUSE (SITTING FOR 6-8 WEEKS)

LUMBER SUPPLIER: _____

LENGTH OF TIME FROM DELIVERY TO ERECTION: _____

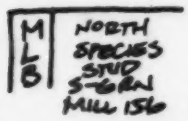
ILLUSTRATE GRADE STAMP: 

PHOTO NO. OF STAMP: 12 & 13

WEATHER CONDITIONS: +4°C RAINING AND OVERCAST

PHOTO NO. OF SITE: _____

STUD # 1: SIZE & LOCATION: 2X6 SOUTH KNEE-WALL

NO STAMP

	MC	T	MC/T	AV.
1/8"TOP:	22	+6°C	30+	30+
3/8"TOP:	30+	+6°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	19	+6°C	29	30+
3/8"BOTT:	22	+6°C	30+	
3/4"BOTT:	___	___	___	
HEADER:	19	+6°C	29	

STUD # 2: SIZE & LOCATION: 2X6 EAST KNEE-WALL

NO STAMP

	MC	T	MC/T	AV.
1/8"TOP:	15	+6°C	23	28
3/8"TOP:	19	+6°C	29	
3/4"TOP:	___	___	___	
1/8"BOTT:	15	+6°C	23	28
3/8"BOTT:	19	+6°C	29	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: 2X6 NORTH KNEE-WALL

STAMP

	MC	T	MC/T	AV.
1/8"TOP:	19	+8°C	28	29
3/8"TOP:	22	+8°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	15	+8°C	22	27
3/8"BOTT:	19	+8°C	28	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: 1X6 BOARD SHEATHING

	MC	T	MC/T	AV.
~~1/8"TOP~~:	___	___	___	30+
3/8"TOP:	22	+4°C	30+	
3/4"TOP:	___	___	___	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS: HAS BEEN COMPLETED FOR 6-8 WEEKS. SOME KNEE-WALL STUD ABOVE 30+% M.C. BUT MAJORITY APPROX. 15-19%. SILL PLATE IN CONTACT WITH CONCRETE FOUNDATION AT 19% MOISTURE CONTENT

WOOD FRAMING MOISTURE STUDY

LOCATION: QUISPAMSIS, NEW BRUNSWICK DATE: JANUARY 7, 1987

CONTRACTOR NAME: HOUSE #9

LUMBER SUPPLIER: LOCAL (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION:

ILLUSTRATE GRADE STAMP: PHOTO NO. OF STAMP: 14

WEATHER CONDITIONS: +4°C RAINING AND OVERCAST PHOTO NO. OF SITE:

STUD # 1: SIZE & LOCATION: 2X6 BETWEEN GARAGE AND FAMILY RM.

STUD # 2: SIZE & LOCATION: 2X4 EAST GARAGE WALL

	MC	T	MC/T	AV.	MC	T	MC/T	AV.
1/8"TOP:	19	+9°C	28	29	22	+6°C	30+	30+
3/8"TOP:	22	+9°C	30+		22	+6°C	30+	
3/4"TOP:								
1/8"BOTT:	19	+9°C	28	29	22	+6°C	30+	30+
3/8"BOTT:	22	+9°C	30+		22	+6°C	30+	
3/4"BOTT:								
HEADER:								

STUD # 3: SIZE & LOCATION:

STUD # 4: SIZE & LOCATION:

	MC	T	MC/T	AV.	MC	T	MC/T	AV.
1/8"TOP:								
3/8"TOP:								
3/4"TOP:								
1/8"BOTT:								
3/8"BOTT:								
3/4"BOTT:								
HEADER:								

GENERAL COMMENTS: DRYWALL BEING PUT UP AT THE TIME. MOST STUDS AT WINDOW FRAMES ETC. WERE EXPOSED AND COULD BE METERED: ALL AT 22% M.C. (30+). ALL 1X6 BOARD SHEATHING METERED AT 22% (30+) M.C.

WOOD FRAMING MOISTURE STUDY

LOCATION: CHERRYBROOK, NOVA SCOTIA DATE: JANUARY 6, 1987

CONTRACTOR NAME: HOUSE #10

LUMBER SUPPLIER: LOCAL (NOVA SCOTIA)

LENGTH OF TIME FROM DELIVERY TO ERECTION: DECEMBER 5 - 20 (15 DAYS)

ILLUSTRATE GRADE STAMP: MLB | NORTH SPECIES STUD S-GRN MILL 191

PHOTO NO. OF STAMP: 6-10

WEATHER CONDITIONS: -7°C CLEAR 76% R.H.

PHOTO NO. OF SITE:

STUD # 1: SIZE & LOCATION: 2x6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	46	0°C	<11	26
3/8"TOP:	18	0°C	29	
3/4"TOP:	18	0°C	29	
1/8"BOTT:	14	0°C	22	27
3/8"BOTT:	17	0°C	27	
3/4"BOTT:	19	0°C	30	
HEADER:	—	—	—	

STUD # 2: SIZE & LOCATION: 2x6 EAST WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	0°C	24	26
3/8"TOP:	17	0°C	27	
3/4"TOP:	19	0°C	30	
1/8"BOTT:	15	0°C	24	27
3/8"BOTT:	17	0°C	27	
3/4"BOTT:	19	0°C	30	
HEADER:	—	—	—	

STUD # 3: SIZE & LOCATION: 2x6 SOUTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	14	0°C	22	27
3/8"TOP:	18	0°C	28	
3/4"TOP:	19	0°C	30	
1/8"BOTT:	12	0°C	19	28
3/8"BOTT:	20	0°C	30+	
3/4"BOTT:	20	0°C	30+	
HEADER:	—	—	—	

STUD # 4: SIZE & LOCATION: 2x6 WEST WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	0°C	24	29
3/8"TOP:	22	0°C	30+	
3/4"TOP:	25	0°C	30+	
1/8"BOTT:	17	0°C	27	29
3/8"BOTT:	20	0°C	30+	
3/4"BOTT:	22	0°C	30+	
HEADER:	—	—	—	

GENERAL COMMENTS: INSULATION AND VAPOUR BARRIER GOING IN. 2x6 STUD W/ 1x6 BOARD SHEATHING

WOOD FRAMING MOISTURE STUDY

LOCATION: GAINSBOROUGH PLACE, NOVA SCOTIA DATE: JANUARY 6, 1987

CONTRACTOR NAME: HOUSE # 11

LUMBER SUPPLIER: LOCAL (NOVA SCOTIA)

LENGTH OF TIME FROM DELIVERY TO ERECTION:

ILLUSTRATE GRADE STAMP: M L B | NORTH SPRUCE STUD S-GRN MILL BD

PHOTO NO. OF STAMP: 11 & 12

WEATHER CONDITIONS: -2°C SUNNY

PHOTO NO. OF SITE:

STUD # 1: SIZE & LOCATION: 2x6 SOUTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	<6	-2°C	<11	22
3/8"TOP:	15	-2°C	24	
3/4"TOP:	14	-2°C	22	
1/8"BOTT:	15	-2°C	24	26
3/8"BOTT:	15	-2°C	24	
3/4"BOTT:	17	-2°C	27	
HEADER:	—	—	—	

STUD # 2: SIZE & LOCATION: 2x6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	12	-2°C	19	22
3/8"TOP:	12	-2°C	19	
3/4"TOP:	17	-2°C	27	
1/8"BOTT:	<6	-2°C	<11	18
3/8"BOTT:	<6	-2°C	<11	
3/4"BOTT:	17	-2°C	27	
HEADER:	—	—	—	

STUD # 3: SIZE & LOCATION: 2x6 WEST WALL

	MC	T	MC/T	AV.
1/8"TOP:	14	-2°C	22	24
3/8"TOP:	17	-2°C	27	
3/4"TOP:	11	-2°C	17	
1/8"BOTT:	<6	-2°C	11	22
3/8"BOTT:	15	-2°C	24	
3/4"BOTT:	17	-2°C	27	
HEADER:	—	—	—	

STUD # 4: SIZE & LOCATION:

	MC	T	MC/T	AV.
1/8"TOP:	—	—	—	—
3/8"TOP:	—	—	—	
3/4"TOP:	—	—	—	
1/8"BOTT:	—	—	—	—
3/8"BOTT:	—	—	—	
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

GENERAL COMMENTS: 2x6 STUD

WOOD FRAMING MOISTURE STUDY

LOCATION: COLCHARBOUR, NOVA SCOTIA DATE: JANUARY 6, 1987

CONTRACTOR NAME: HOUSE #12 (20 UNIT APARTMENT)

LUMBER SUPPLIER: LOCAL (NOVA SCOTIA)

LENGTH OF TIME FROM DELIVERY TO ERECTION: _____

ILLUSTRATE GRADE STAMP:

M	S-P-F
L	NO. 1
B	S-GRN
	MILL 198

PHOTO NO. OF STAMP: _____

WEATHER CONDITIONS: -2°C AND SUNNY

PHOTO NO. OF SITE: 10

STUD # 1: SIZE & LOCATION: 2X6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	-2°C	24	
3/8"TOP:	17	-2°C	27	27
3/4"TOP:	19	-2°C	30	
1/8"BOTT:	15	-2°C	24	
3/8"BOTT:	17	-2°C	27	26
3/4"BOTT:	19	-2°C	24	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: 2X4 (GRAVIMETRIC SAMPLE)

	MC	T	MC/T	AV.
1/8"TOP:	22	-2°	30+	
3/8"TOP:	25	-2°	30+	30+
3/4"TOP:	25	-2°	30+	
1/8"BOTT:	___	___	___	
3/8"BOTT:	___	___	___	___
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: _____

	MC	T	MC/T	AV.
1/8"TOP:	___	___	___	
3/8"TOP:	___	___	___	___
3/4"TOP:	___	___	___	
1/8"BOTT:	___	___	___	
3/8"BOTT:	___	___	___	___
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: _____

	MC	T	MC/T	AV.
1/8"TOP:	___	___	___	
3/8"TOP:	___	___	___	___
3/4"TOP:	___	___	___	
1/8"BOTT:	___	___	___	
3/8"BOTT:	___	___	___	___
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS: FRAMED NOT INSULATED

WOOD FRAMING MOISTURE STUDY

LOCATION: CHERRYBROOK, NOVA SCOTIA DATE: JANUARY 6, 1987

CONTRACTOR NAME: HOUSE #13 (LOWER BUILT)

LUMBER SUPPLIER: LOCAL (NOVA SCOTIA)

LENGTH OF TIME FROM DELIVERY TO ERECTION: 3 DAYS FROM DELIVERY

ILLUSTRATE GRADE STAMP:

M	NORTH
L	SPECIES
B	STUD
	S-GRN
	MILL 88

PHOTO NO. OF STAMP: _____

WEATHER CONDITIONS: -7°C AND SUNNY

PHOTO NO. OF SITE: 1-4

STUD # 1: SIZE & LOCATION: 2x6 WEST WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	-2°C	22	27
3/8"TOP:	19	-2°C	28	
3/4"TOP:	19	-2°C	28	
1/8"BOTT:	17	-2°C	25	27
3/8"BOTT:	19	-2°C	28	
3/4"BOTT:	19	-2°C	28	
HEADER:	—	—	—	

STUD # 2: SIZE & LOCATION: 2x6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	<6	-2°C	<11	23
3/8"TOP:	18	-2°C	26	
3/4"TOP:	19	-2°C	28	
1/8"BOTT:	17	-2°C	25	27
3/8"BOTT:	19	-2°C	28	
3/4"BOTT:	20	-2°C	29	
HEADER:	—	—	—	

STUD # 3: SIZE & LOCATION: 2x6 SOUTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	15	-2°C	22	27
3/8"TOP:	19	-2°C	28	
3/4"TOP:	19	-2°C	28	
1/8"BOTT:	15	-2°C	22	24
3/8"BOTT:	17	-2°C	25	
3/4"BOTT:	19	-2°C	28	
HEADER:	—	—	—	

STUD # 4: SIZE & LOCATION: 2x6 EAST WALL

	MC	T	MC/T	AV.
1/8"TOP:	17	-2°C	25	29
3/8"TOP:	21	-2°C	30	
3/4"TOP:	23	-2°C	30+	
1/8"BOTT:	15	-2°C	22	27
3/8"BOTT:	19	-2°C	28	
3/4"BOTT:	20	-2°C	29	
HEADER:	—	—	—	

GENERAL COMMENTS: 29°F D.B.
27°F W.B. = 76% R.H.

WOOD FRAMING MOISTURE STUDY

LOCATION: ST. JOHN'S, NEWFOUNDLAND DATE: JUNE 1, 1987

CONTRACTOR NAME: LUMBER COMPANY

LUMBER SUPPLIER:

LENGTH OF TIME FROM DELIVERY TO ERECTION:

ILLUSTRATE GRADE STAMP:

NFLD LUMBER

N	NORTH SPECIES
L	STUD
D	S-GRN
A	MILL 003

PHOTO NO. OF STAMP:

WEATHER CONDITIONS: 11°C AND OVERCAST

PHOTO NO. OF SITE:

STUD # 1: SIZE & LOCATION: 2X4 IN PILE

STAMP MID-LENGTH	MC	T	MC/T	AV.
1/8" ~~TOP~~:	23	8°C	30+	30
3/8" ~~TOP~~:	30+	8°C	30+	
3/4" ~~TOP~~:	30+	8°C	30+	
1/8" BOTT:				
3/8" BOTT:				
3/4" BOTT:				
HEADER:				

STUD # 2: SIZE & LOCATION: 2X6 IN PILE

STAMP MID-LENGTH	MC	T	MC/T	AV.
#1 1/8" ~~TOP~~:	20	8°C	30+	30+
#1 3/8" ~~TOP~~:	22	8°C	30+	
#1 3/4" ~~TOP~~:	25	8°C	30+	
#2 1/8" ~~BOTT~~:	30+	8°C	30+	30+
#2 3/8" ~~BOTT~~:	30+	8°C	30+	
#2 3/4" ~~BOTT~~:	30+	8°C	30+	
HEADER:				

STUD # 3: SIZE & LOCATION: 1X6 BOARDS

NO STAMP MID-LENGTH	MC	T	MC/T	AV.
1/8" ~~TOP~~:	17	12°C	25	27
3/8" ~~TOP~~:	19	12°C	28	
3/4" ~~TOP~~:	19	12°C	28	
1/8" BOTT:				
3/8" BOTT:				
3/4" BOTT:				
HEADER:				

STUD # 4: SIZE & LOCATION: 2X10 B.C. KILN-DRY

CF 137 S-P-F S-DRY NO.1

STAMP MID-LENGTH	MC	T	MC/T	AV.
#1 1/8" ~~TOP~~:	20	12°C	30+	2
#1 3/8" ~~TOP~~:	13	12°C	19	
#1 3/4" ~~TOP~~:	13	12°C	19	
#2 1/8" ~~BOTT~~:	13	12°C	19	19
#2 3/8" ~~BOTT~~:	13	12°C	19	
#2 3/4" ~~BOTT~~:	13	12°C	22	
HEADER:				

GENERAL COMMENTS: 2X12 PINE (INDOORS) FOR FURNITURE IS AT 6-8% M.C. (10-11% M.C. NOTE: ALL YARD LUMBER HAS BEEN EXPOSED TO DRIZZLING AND RAINY WEATHER FOR THE PAST 3 WEEKS.

WOOD FRAMING MOISTURE STUDY

LOCATION: ST. JOHN'S, NEWFOUNDLAND DATE: JUNE 1, 1987

CONTRACTOR NAME: HOUSE #14

LUMBER SUPPLIER: LOCAL (NEWFOUNDLAND)

LENGTH OF TIME FROM DELIVERY TO ERECTION: SAME DAY

ILLUSTRATE GRADE STAMP:

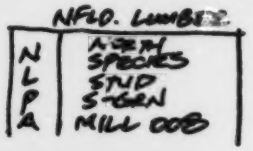


PHOTO NO. OF STAMP: _____

WEATHER CONDITIONS: 12°C AND OVERCAST

PHOTO NO. OF SITE: _____

STUD # 1: SIZE & LOCATION: 2x6 WEST WALL

	MC	T	MC/T	AV.
MID-LENGTH 1/8"~~TOP~~:	13	11°C	19	21
3/8"~~TOP~~:	15	11°C	22	
3/4"~~TOP~~:	15	11°C	22	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: 2x6 SOUTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	13	11°C	19	26
3/8"TOP:	19	11°C	28	
3/4"TOP:	19	11°C	28	
1/8"BOTT:	13	11°C	19	26
3/8"BOTT:	19	11°C	28	
3/4"BOTT:	19	11°C	28	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: 2x6 EAST WALL

	MC	T	MC/T	AV.
MID-LENGTH 1/8"~~TOP~~:	13	11°C	19	22
3/8"~~TOP~~:	15	11°C	22	
3/4"~~TOP~~:	19	11°C	28	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: 2x6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	13	11°C	19	22
3/8"TOP:	15	11°C	22	
3/4"TOP:	19	11°C	28	
1/8"BOTT:	13	11°C	19	22
3/8"BOTT:	15	11°C	22	
3/4"BOTT:	19	11°C	28	
HEADER:	___	___	___	

GENERAL COMMENTS: 1X8 BOARD SHEATHING AT 13% M.C. (1%)
2x4 STUDS AT 13 15 15 (19, 22, 22) MOISTURE CONTENT.

WOOD FRAMING MOISTURE STUDY

LOCATION: ST. JOHN'S, NEWFOUNDLAND DATE: JUNE 1, 1987

CONTRACTOR NAME: HOUSE #15

LUMBER SUPPLIER: LOCAL (NEWFOUNDLAND)

LENGTH OF TIME FROM DELIVERY TO ERECTION: 1 DAY

ILLUSTRATE GRADE STAMP:

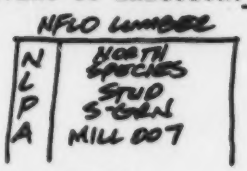


PHOTO NO. OF STAMP: _____

WEATHER CONDITIONS: 12°C OVERCAST

PHOTO NO. OF SITE: _____

STUD # 1: SIZE & LOCATION: 2x6 SOUTH WALL

	MC	T	MC/T	AV.
MID-LENGTH				
1/8" TOP:	13	12°C	19	
3/8" TOP:	19	12°C	28	26
3/4" TOP:	19	12°C	28	
1/8" BOTT:	—	—	—	
3/8" BOTT:	—	—	—	—
3/4" BOTT:	—	—	—	
HEADER:	—	—	—	

STUD # 2: SIZE & LOCATION: 2x6 EAST WALL

	MC	T	MC/T	AV.
MID-LENGTH				
1/8" TOP:	13	12°C	19	
3/8" TOP:	15	12°C	22	22
3/4" TOP:	19	12°C	28	
1/8" BOTT:	—	—	—	
3/8" BOTT:	—	—	—	—
3/4" BOTT:	—	—	—	
HEADER:	—	—	—	

STUD # 3: SIZE & LOCATION: 2x6 NORTH WALL

	MC	T	MC/T	AV.
MID-LENGTH				
1/8" TOP:	13	12°C	19	
3/8" TOP:	13	12°C	19	19
3/4" TOP:	15	12°C	22	
1/8" BOTT:	—	—	—	
3/8" BOTT:	—	—	—	—
3/4" BOTT:	—	—	—	
HEADER:	—	—	—	

STUD # 4: SIZE & LOCATION: 2x6 WEST WALL

	MC	T	MC/T	AV.
MID-LENGTH				
1/8" TOP:	19	12°C	28	
3/8" TOP:	22	12°C	30+	30+
3/4" TOP:	22	12°C	30+	
1/8" BOTT:	—	—	—	
3/8" BOTT:	—	—	—	—
3/4" BOTT:	—	—	—	
HEADER:	—	—	—	

GENERAL COMMENTS: 1X8 BOARD SHEATHING AT 10% (USE) M.C.
R.H = 49°F DB + 46°F WB = 80% R.H.

WOOD FRAMING MOISTURE STUDY

LOCATION: ST. JOHN'S, NEWFOUNDLAND DATE: JUNE 1, 1987

CONTRACTOR NAME: HOUSE #16

LUMBER SUPPLIER: LOCAL (NEWFOUNDLAND)

LENGTH OF TIME FROM DELIVERY TO ERECTION: SAME DAY

ILLUSTRATE GRADE STAMP: NLPA | NORTH SPECIES NO. 2 S-GRN MILL 050 PHOTO NO. OF STAMP: _____

WEATHER CONDITIONS: 11°C AND OVERCAST PHOTO NO. OF SITE: _____

STUD # 1: SIZE & LOCATION: 2x6 NORTH WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	13	9°C	19	21
3/8"TOP:	15	9°C	22	
3/4"TOP:	15	9°C	22	
1/8"BOTT:	13	9°C	19	21
3/8"BOTT:	15	9°C	22	
3/4"BOTT:	15	9°C	22	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: 2x6 WEST WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	15	9°C	19	22
3/8"TOP:	19	9°C	22	
3/4"TOP:	22	9°C	30+	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: 2x6 EAST WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	15	9°C	22	28
3/8"TOP:	19	9°C	28	
3/4"TOP:	20	9°C	30+	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: 2x6 SOUTH WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	15	9°C	22	27
3/8"TOP:	19	9°C	28	
3/4"TOP:	19	9°C	28	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS: 1X6 BOARD SHEATHING AT 13 TO (19) MOISTURE CONTENT.

WOOD FRAMING MOISTURE STUDY

LOCATION: ST. JOHN'S, NEWFOUNDLAND DATE: JUNE 1, 1987

CONTRACTOR NAME: HOUSE #17

LUMBER SUPPLIER: LOCAL (NEWFOUNDLAND)

LENGTH OF TIME FROM DELIVERY TO ERECTION:

ILLUSTRATE GRADE STAMP:

NFLD LUMBER

N L P A	S-P-F STUD S-GRN MILL001

PHOTO NO. OF STAMP:

WEATHER CONDITIONS: 11°C AND OVERCAST

PHOTO NO. OF SITE:

STUD # 1: SIZE & LOCATION: 2x6 NORTH WALL

STUD # 2: SIZE & LOCATION: 2x6 EAST WALL

	MC	T	MC/T	AV.		MC	T	MC/T	AV.
1/8"TOP:	13	10°C	19	21	1/8"TOP:	19	10°C	28	30+
3/8"TOP:	15	10°C	22		3/8"TOP:	22	10°C	30+	
3/4"TOP:	15	10°C	22		3/4"TOP:	22	10°C	30+	
1/8"BOTT:	13	10°C	19	21	1/8"BOTT:	19	10°C	28	30+
3/8"BOTT:	15	10°C	22		3/8"BOTT:	25	10°C	30+	
3/4"BOTT:	15	10°C	22		3/4"BOTT:	30+	10°C	30+	
HEADER:	—	—	—		HEADER:	—	—	—	

STUD # 3: SIZE & LOCATION: 2x6 SOUTH WALL

STUD # 4: SIZE & LOCATION: 2x6 WEST WALL

		MC	T	MC/T	AV.		MC	T	MC/T	AV.
	MID-LENGTH					MID-LENGTH				
#1	1/8"TOP:	15	10°C	22	27	1/8"TOP:	13	10°C	19	26
	3/8"TOP:	19	10°C	28		3/8"TOP:	19	10°C	28	
	3/4"TOP:	19	10°C	28		3/4"TOP:	19	10°C	28	
#2	1/8"BOTT:	19	10°C	28	30+	1/8"BOTT:	—	—	—	—
	3/8"BOTT:	25	10°C	30+		3/8"BOTT:	—	—	—	
	3/4"BOTT:	30+	10°C	30+		3/4"BOTT:	—	—	—	
	HEADER:	—	—	—		HEADER:	—	—	—	

GENERAL COMMENTS: 1 WEEK FROM INSULATING
1x6 BOARD SHEATHING AT 13% (12) MOISTURE CONTENT

WOOD FRAMING MOISTURE STUDY

LOCATION: ST. JOHN'S, NEWFOUNDLAND DATE: JUNE 1, 1987

CONTRACTOR NAME: HOUSE #18

LUMBER SUPPLIER: LOCAL (NEWFOUNDLAND)

LENGTH OF TIME FROM DELIVERY TO ERECTION: SAME DAY

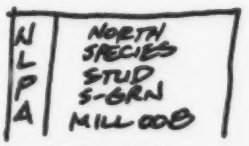
ILLUSTRATE GRADE STAMP: 

PHOTO NO. OF STAMP: _____

WEATHER CONDITIONS: 11°C AND OVERCAST

PHOTO NO. OF SITE: _____

STUD # 1: SIZE & LOCATION: 2x6 WEST WALL

		MC	T	MC/T	AV.
	MID-LENGTH				
#1	1/8"TOP:	13	10°C	18	21
#1	3/8"TOP:	15	10°C	22	
#1	3/4"TOP:	15	10°C	22	
#2	1/8"BOTT:	13	10°C	18	21
#2	3/8"BOTT:	15	10°C	22	
#2	3/4"BOTT:	15	10°C	22	
	HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: 2x6 EAST WALL

		MC	T	MC/T	AV.
	MID-LENGTH				
#1	1/8"TOP:	15	10°C	22	27
#1	3/8"TOP:	19	10°C	28	
#1	3/4"TOP:	19	10°C	28	
#2	1/8"BOTT:	19	10°C	28	30+
#2	3/8"BOTT:	30+	10°C	30+	
#2	3/4"BOTT:	30+	10°C	30+	
	HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: 2x6 NORTH WALL

	MC	T	MC/T	AV.
MID-LENGTH				
1/8"TOP:	13	10°C	18	21
3/8"TOP:	15	10°C	22	
3/4"TOP:	15	10°C	22	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: 2x6 SOUTH WALL

	MC	T	MC/T	AV.
MID-LENGTH				
1/8"TOP:	13	10°C	18	21
3/8"TOP:	15	10°C	22	
3/4"TOP:	15	10°C	22	
1/8"BOTT:	19	10°C	28	28
3/8"BOTT:	19	10°C	28	
3/4"BOTT:	19	10°C	28	
HEADER:	___	___	___	

GENERAL COMMENTS: 1x10 SHEATHING (HEMLOCK) AT 13% (19) M.C.

R.H - 47 WB + 51 DRY = 75%

WOOD FRAMING MOISTURE STUDY

LOCATION: ELMSDALE, NOVA SCOTIA DATE: JUNE 2, 1987

CONTRACTOR NAME: MILL (AIR-DRY : NO KILN)

LUMBER SUPPLIER: OWNED FOREST RESERVES

LENGTH OF TIME FROM DELIVERY TO ERECTION: _____

ILLUSTRATE GRADE STAMP: | M L B | S-P-F No. 1 S-GRN MILL 19 |

PHOTO NO. OF STAMP: _____

WEATHER CONDITIONS: 16°C AND SUNNY

PHOTO NO. OF SITE: 1-8

STUD # 1: SIZE & LOCATION: LOGS CUT IN MARCH 1987

END OF LOG	MC	T	MC/T	AV.
1/8"TOP:	22	15°C	30+	30+
3/8"TOP:	22	15°C	30+	
3/4"TOP:	22	15°C	30+	
½ LOG 1/8"BOTT:	30+	15°C	30+	30+
CUT IN MILL AFTER DEBARKING 3/8"BOTT:	30+	15°C	30+	
3/4"BOTT:	30+	15°C	30+	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: 2×8×14' (IN PILE)

	MC	T	MC/T	AV.
1/8"TOP:	19	15°C	27	27
3/8"TOP:	19	15°C	27	
3/4"TOP:	19	15°C	27	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: 8×10 SQUARED TIMBER

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	22	15°C	30+	30+
3/8"TOP:	30+	15°C	30+	
3/4"TOP:	30+	15°C	30+	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: 2×7×16' (IN PILE)

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	19	15°C	27	27
3/8"TOP:	19	15°C	27	
3/4"TOP:	19	15°C	27	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS: 10 MILLION BOARD FEET/YR PRODUCTION CAPABILITY. YEAR ROUND PRODUCTION.

WOOD FRAMING MOISTURE STUDY

LOCATION: ELMSDALE, NOVA SCOTIA DATE: JUNE 2, 1987

CONTRACTOR NAME: COMMERCIAL PLAZA (FRAMED FOR 4-5 WEEKS)

LUMBER SUPPLIER: LOCAL (NOVA SCOTIA)

LENGTH OF TIME FROM DELIVERY TO ERECTION: SAME DAY

ILLUSTRATE GRADE STAMP: NO GRADE STAMP PHOTO NO. OF STAMP: ____

WEATHER CONDITIONS: 15°C AND SUNNY PHOTO NO. OF SITE: ____

STUD # 1: SIZE & LOCATION: 2x6 SOUTH WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	13	15°C	18	18
3/8"TOP:	13	15°C	18	
3/4"TOP:	13	15°C	18	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: 2x6 EAST WALL

MID-LENGTH	MC	T	MC/T	AV.
#1 1/8"TOP:	13	15°C	18	20
#1 3/8"TOP:	15	15°C	21	
#1 3/4"TOP:	19	15°C	27	
#2 1/8"BOTT:	19	15°C	27	29
#2 3/8"BOTT:	22	15°C	30+	
#2 3/4"BOTT:	25	15°C	30+	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: 2x4 INTERIOR STUDS

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	25	15°C	30+	30+
3/8"TOP:	30+	15°C	30+	
3/4"TOP:	30+	15°C	30+	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: ____

	MC	T	MC/T	AV.
1/8"TOP:	___	___	___	___
3/8"TOP:	___	___	___	
3/4"TOP:	___	___	___	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS: FRAMED FOR 4 WEEKS. MOST 2X6 STUDS TESTED RANGED FROM 13-19 % (18-27%) MOISTURE CONTENT. MOISTURE CONTENT OF SHEATHING (½" PLYWOOD) 19-25 % (27-30+%)

WOOD FRAMING MOISTURE STUDY

LOCATION: HALIFAX, NOVA SCOTIA DATE: JUNE 2, 1987

CONTRACTOR NAME: HOUSE #19 (TOWN HOUSES)

LUMBER SUPPLIER: LOCAL (NOVA SCOTIA)

LENGTH OF TIME FROM DELIVERY TO ERECTION:

ILLUSTRATE GRADE STAMP:

M	S-P-F
L	STUD
B	S-DRY
	MILL 19B

M	NORTH SPRUCE
L	No. 1
B	S-DRY
	MILL 19

PHOTO NO. OF STAMP: 19-24

WEATHER CONDITIONS: 23°C AND SUNNY

PHOTO NO. OF SITE: 13-18

STUD # 1: SIZE & LOCATION: 2x6 STUD (IN PILE)

MILL 19 MID-LENGTH	MC	T	MC/T	AV.
#1 1/8"TOP:	22	19°C	30+	30+
#1 3/8"TOP:	30+	19°C	30+	
#1 3/4"TOP:	30+	19°C	30+	
#2 #3 1/8"BOTT:	30+ 30+	19°C	30+ 30+	30+ 30+
#2 #3 3/8"BOTT:	30+ 30+	19°C	30+ 30+	
#2 #3 3/4"BOTT:	30+ 30+	19°C	30+ 30+	
HEADER:	—	—	—	

STUD # 2: SIZE & LOCATION: 2x6 WEST WALL

MILL 19B	MC	T	MC/T	AV.
1/8"TOP:	15	19°C	21	25
3/8"TOP:	19	19°C	26	
3/4"TOP:	19	19°C	26	
1/8"BOTT:	15	19°C	21	25
3/8"BOTT:	19	19°C	26	
3/4"BOTT:	19	19°C	26	
HEADER:	—	—	—	

STUD # 3: SIZE & LOCATION: 2x6 NORTH WALL

MILL 19B MID-LENGTH	MC	T	MC/T	AV.
#1 1/8"TOP:	25	19°C	30+	30+
#1 3/8"TOP:	30+	19°C	30+	
#1 3/4"TOP:	30+	19°C	30+	
#2 1/8"BOTT:	13	19°C	18	20
#2 3/8"BOTT:	15	19°C	21	
#2 3/4"BOTT:	15	19°C	21	
HEADER:	—	—	—	

STUD # 4: SIZE & LOCATION: 2x6 EAST WALL

MILL 19B	MC	T	MC/T	AV.
1/8"TOP:	13	19°C	18	20
3/8"TOP:	15	19°C	21	
3/4"TOP:	15	19°C	21	
1/8"BOTT:	13	19°C	18	21
3/8"BOTT:	15	19°C	21	
3/4"BOTT:	19	19°C	26	
HEADER:	—	—	—	

GENERAL COMMENTS: ½" PLYWOOD SHEATHING AT 82 (10) MOISTURE CONTENT

WOOD FRAMING MOISTURE STUDY

LOCATION: LOWER SACKVILLE, NOVA SCOTIA DATE: JUNE 2, 1987

CONTRACTOR NAME: COMPLETED HOUSE (FRAMED 4 WEEKS AGO)

LUMBER SUPPLIER: LOCAL (NOVA SCOTIA)

LENGTH OF TIME FROM DELIVERY TO ERECTION: _____

ILLUSTRATE GRADE STAMP:

M L B	S-P-F STUD S-GRN MILL 198

PHOTO NO. OF STAMP: _____

WEATHER CONDITIONS: 23°C AND SUNNY

PHOTO NO. OF SITE: 23-26

STUD # 1: SIZE & LOCATION: 2X6 NORTH WALL

	MC	T	MC/T	AV.
1/8"TOP:	13	18°C	18	18
3/8"TOP:	13	18°C	18	
3/4"TOP:	14	18°C	19	
1/8"BOTT:	13	18°C	18	20
3/8"BOTT:	15	18°C	21	
3/4"BOTT:	15	18°C	21	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: 2X6 WEST WALL

	MC	T	MC/T	AV.
MID-LENGTH 1/8"TOP:	13	18°C	18	18
3/8"TOP:	13	18°C	18	
3/4"TOP:	13	18°C	18	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: 2X6 SOUTH WALL

	MC	T	MC/T	AV.
MID-LENGTH 1/8"TOP:	13	18°C	18	20
3/8"TOP:	15	18°C	21	
3/4"TOP:	15	18°C	21	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: 2X6 EAST WALL

	MC	T	MC/T	AV.
MID-LENGTH 1/8"TOP:	13	18°C	18	18
3/8"TOP:	13	18°C	18	
3/4"TOP:	15	18°C	21	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS: 1X6 BOARD SHEATHING AT 13 13 (18 18) MOISTURE CONTENT
NOTE: THIS HOUSE HAD BEEN SITTING IDLE FOR OVER 4 WEEKS. (LIEN)
JUNE 2 WAS FIRST DAY BACK ON THE SITE.

WOOD FRAMING MOISTURE STUDY

LOCATION: PENNFIELD, NEW BRUNSWICK DATE: JUNE 3, 1987

CONTRACTOR NAME: MILL (KILN-DRY FACILITY)

LUMBER SUPPLIER: LOCAL (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION: GREEN YARD LUMBER

ILLUSTRATE GRADE STAMP: PHOTO NO. OF STAMP: ____

WEATHER CONDITIONS: 18°C AND SUNNY PHOTO NO. OF SITE: 27-36

STUD # 1: SIZE & LOCATION: (2 STUDS) 2x6 CUT MAY 7, 1987

MID-LENGTH	MC	T	MC/T	AV.
1/8" TOP:	15	18°C	21	21
3/8" TOP:	15	18°C	21	
3/4" TOP:	19	18°C	26	
1/8" BOTT:	___	___	___	___
3/8" BOTT:	___	___	___	
3/4" BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: (3 STUDS) 2x6 CUT JUNE 1, 1987

	MC	T	MC/T	AV.
1/8" TOP:	19	18°C	26	29
3/8" TOP:	22	18°C	30+	
3/4" TOP:	25	18°C	30+	
1/8" BOTT:	___	___	___	___
3/8" BOTT:	___	___	___	
3/4" BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: (3 STUDS) 2x6 CUT JUNE 3, 1987

MID-LENGTH	MC	T	MC/T	AV.
1/8" TOP:	25	18°C	30+	30+
3/8" TOP:	30+	18°C	30+	
3/4" TOP:	30+	18°C	30+	
1/8" BOTT:	___	___	___	___
3/8" BOTT:	___	___	___	
3/4" BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: (3 STUDS) 2x4 JUST PRIOR TO KILN-DRY

MID-LENGTH	MC	T	MC/T	AV.
1/8" TOP:	19	18°C	26	29
3/8" TOP:	22	18°C	30+	
3/4" TOP:	25	18°C	30+	
1/8" BOTT:	___	___	___	___
3/8" BOTT:	___	___	___	
3/4" BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS:
NOTE: "GREEN YARD" LUMBER HAS BEEN MILLED BUT NOT KILN-DRY OR PLANED. ALL LUMBER IS ROUGH-SAWN.

WOOD FRAMING MOISTURE STUDY

LOCATION: PENNFIELD, NEW BRUNSWICK DATE: JUNE 3, 1987

CONTRACTOR NAME: _____

LUMBER SUPPLIER: _____

LENGTH OF TIME FROM DELIVERY TO ERECTION: KILN-DRY LUMBER

ILLUSTRATE GRADE STAMP: PHOTO NO. OF STAMP: _____

WEATHER CONDITIONS: 18°C AND SUNNY PHOTO NO. OF SITE: _____

STUD # 1: SIZE & LOCATION: 2X4 JUST OUT OF KILN

MID-LENGTH	MC	T	MC/T	AV.
#1 1/8"TOP:	8	63°	___	___
#1 3/8"TOP:	10	63°	___	
#1 3/4"TOP:	10	63°	___	
#2 1/8"BOTT:	19	63°	___	___
#2 3/8"BOTT:	19	63°	___	
#2 3/4"BOTT:	22	63°	___	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: 2X4 JUST OUT OF KILN

MID-LENGTH	MC	T	MC/T	AV.
#3 1/8"TOP:	19	63°	___	___
#3 3/8"TOP:	19	63°	___	
#3 3/4"TOP:	22	63°	___	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 3: SIZE & LOCATION: 2X3 AFTER PLANED (INDOORS)

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	10	25°C	13	16
3/8"TOP:	13	25°C	17	
3/4"TOP:	13	25°C	17	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

STUD # 4: SIZE & LOCATION: _____

	MC	T	MC/T	AV.
1/8"TOP:	___	___	___	___
3/8"TOP:	___	___	___	
3/4"TOP:	___	___	___	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

GENERAL COMMENTS:

WOOD FRAMING MOISTURE STUDY

LOCATION: SAINT JOHN, NEW BRUNSWICK DATE: JUNE 3, 1987

CONTRACTOR NAME: HOUSE #20

LUMBER SUPPLIER: LOCAL (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION: SAME DAY

ILLUSTRATE GRADE STAMP: CLQA SPF 702 No.2 S-GRN PHOTO NO. OF STAMP: 6 & 7

WEATHER CONDITIONS: 17°C AND SUNNY PHOTO NO. OF SITE: 1-9 & 11

STUD # 1: SIZE & LOCATION: 2x6 WEST WALL

	MID-LENGTH	MC	T	MC/T	AV.
#1	1/8"TOP:	17	17°C	24	29
	3/8"TOP:	25	17°C	30+	
	3/4"TOP:	30+	17°C	30+	
#2	1/8"BOTT:	19 19	17°C	27 27	29
#3	3/8"BOTT:	25 22	17°C	30+ 30+	
	3/4"BOTT:	32 25	17°C	30+ 30+	
	HEADER:	—	—	—	

STUD # 2: SIZE & LOCATION: 2x6 SOUTH WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	15	17°C	21	26
3/8"TOP:	19	17°C	27	
3/4"TOP:	19	17°C	27	
1/8"BOTT:	—	—	—	—
3/8"BOTT:	—	—	—	
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

STUD # 3: SIZE & LOCATION: 2x6 EAST KNEE-WALL (BASEMENT)

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	13	17°C	18	20
3/8"TOP:	15	17°C	21	
3/4"TOP:	15	17°C	21	
1/8"BOTT:	—	—	—	—
3/8"BOTT:	—	—	—	
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

STUD # 4: SIZE & LOCATION: 2x6 NORTH WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	19	17°C	27	29
3/8"TOP:	22	17°C	30+	
3/4"TOP:	25	17°C	30+	
1/8"BOTT:	—	—	—	—
3/8"BOTT:	—	—	—	
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

GENERAL COMMENTS: STARTED FRAMING ON MAY 24, 1987.
2x10 B.C. KILN-DRY FLOOR JOISTS 18 15 19 (18 21 27) MOISTURE CONTENT
2x4 STUDS (NO STAMP) 15 19 22 (21 27 30+) ROOF TRUSSES MOISTURE @ 21.

WOOD FRAMING MOISTURE STUDY

LOCATION: SAINT JOHN, NEW BRUNSWICK DATE: JUNE 3, 1987

CONTRACTOR NAME: HOUSE #21 (OWNER BUILT)

LUMBER SUPPLIER: DIFFERENT SOURCES

LENGTH OF TIME FROM DELIVERY TO ERECTION: 1 DAY.

ILLUSTRATE GRADE STAMP: CL (21) S-P-F 702 STUD S-GRN

PHOTO NO. OF STAMP: 11-13

WEATHER CONDITIONS: 17°C AND SUNNY

PHOTO NO. OF SITE: 10

STUD # 1: SIZE & LOCATION:

2x6 SOUTH WALL

	MID-LENGTH	MC	T	MC/T	AV.
#1	1/8"TOP:	15	17°C	21	21
	3/8"TOP:	15	17°C	21	
	3/4"TOP:	19	17°C	27	
#2 #3	1/8"BOTT:	19 19	17°C	27 27	29
	3/8"BOTT:	22 25	17°C	30+ 30+	
	3/4"BOTT:	30+ 30+	17°C	30+ 30+	
	HEADER:				

STUD # 2: SIZE & LOCATION:

2x6 WEST WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	13	17°C	18	20
3/8"TOP:	15	17°C	21	
3/4"TOP:	19	17°C	27	
1/8"BOTT:				
3/8"BOTT:				
3/4"BOTT:				
HEADER:				

STUD # 3: SIZE & LOCATION:

2x6 NORTH WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	13	17°C	18	20
3/8"TOP:	15	17°C	21	
3/4"TOP:	19	17°C	27	
1/8"BOTT:				
3/8"BOTT:				
3/4"BOTT:				
HEADER:				

STUD # 4: SIZE & LOCATION:

2x6 EAST WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	15	17°C	21	21
3/8"TOP:	15	17°C	21	
3/4"TOP:	19	17°C	27	
1/8"BOTT:				
3/8"BOTT:				
3/4"BOTT:				
HEADER:				

GENERAL COMMENTS: HOUSE HAS BEEN FRAMED FOR 2 WEEKS
2x4 STUDS (KILN-DRY) 13 15 15 (18 21 21) MOISTURE CONTENT
1x10 BOARD SHEATHING 13 15 (18 21)

WOOD FRAMING MOISTURE STUDY

LOCATION: QUISPAMSIS, NEW BRUNSWICK DATE: JUNE 3, 1987

CONTRACTOR NAME: LUMBER COMPANY

LUMBER SUPPLIER: LOCAL (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION: _____

ILLUSTRATE GRADE STAMP: PHOTO NO. OF STAMP: 20, 22 & 23

WEATHER CONDITIONS: 22°C AND SUNNY PHOTO NO. OF SITE: 21 & 24

STUD # 1: SIZE & LOCATION: 2X10 BRITISH COLUMBIA KILN-DRY

MID-LENGTH	MC	T	MC/T	AV.
PILE 1: #1 1/8"~~TOP~~:	13	18°C	18	20
3/8"~~TOP~~:	15	18°C	21	
3/4"~~TOP~~:	15	18°C	21	
PILE 2: #2 #3 1/8"~~BOTT~~:	15 19	18°C	21 26	26
3/8"~~BOTT~~:	19 19	18°C	26 26	
3/4"~~BOTT~~:	19 22	18°C	26 30+	
HEADER:	___	___	___	

STUD # 2: SIZE & LOCATION: 2X6 STUDS (IN PILE)

MID-LENGTH	MC	T	MC/T	AV.
1/8"~~TOP~~:	25	18°C	30+	30+
3/8"~~TOP~~:	30+	18°C	30+	
3/4"~~TOP~~:	30+	18°C	30+	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

CL@ S-P-F 160 STUD GRADE

STUD # 3: SIZE & LOCATION: 2X6 STUDS (IN PILE)

	MC	T	MC/T	AV.
1/8"TOP:	30+	18°C	30+	30+
3/8"TOP:	30+	18°C	30+	
3/4"TOP:	30+	18°C	30+	
1/8"BOTT:	___	___	___	___
3/8"BOTT:	___	___	___	
3/4"BOTT:	___	___	___	
HEADER:	___	___	___	

MLB S-P-F STUD GRADE MILL 134

STUD # 4: SIZE & LOCATION: 2X10 AIR-DRY (LOW DEMAND)

	MC	T	MC/T	AV.
#1 1/8"TOP:	30+	18°C	30+	30+
3/8"TOP:	30+	18°C	30+	
3/4"TOP:	30+	18°C	30+	
#2 1/8"BOTT:	13	18°C	18	25
3/8"BOTT:	19	18°C	26	
3/4"BOTT:	19	18°C	26	
HEADER:	___	___	___	

MLB NORTH SPECIES NO. 1 GRADE MILL 85

MLB NORTH SPECIES NO. 2 GRADE MILL 135

GENERAL COMMENTS: IN EACH PILE 4 STUD READINGS WERE TAKEN IN THE PILE TO CHECK CONSISTENCY.

WOOD FRAMING MOISTURE STUDY

LOCATION: CHARLOTTETOWN, P.E.I. DATE: JUNE 4, 1987

CONTRACTOR NAME: LUMBER COMPANY

LUMBER SUPPLIER: IMPORTED OFF-SHORE (NEW BRUNSWICK)

LENGTH OF TIME FROM DELIVERY TO ERECTION:

ILLUSTRATE GRADE STAMP: PHOTO NO. OF STAMP: 13-17

WEATHER CONDITIONS: 17°C AND SUNNY PHOTO NO. OF SITE: 7-12

STUD # 1: SIZE & LOCATION: 2X4 ECONOMY STUD (NO STAMP)

MID-LENGTH	MC	T	MC/T	AV.
1/8" TOP:	30+	14°C	30+	30+
3/8" TOP:	30+	14°C	30+	
3/4" TOP:	30+	14°C	30+	
1/8" BOTT:	30+	14°C	30+	30+
3/8" BOTT:	30+	14°C	30+	
3/4" BOTT:	30+	14°C	30+	
HEADER:				

STUD # 2: SIZE & LOCATION: 2X12X16' B.C. KILN-DRY DEL. JAN. 22/87

MID-LENGTH	MC	T	MC/T	AV.
#1 1/8" TOP:	19 15	16°C	27 21	29 26
#2 3/8" TOP:	22 19	16°C	30+ 27	
3/4" TOP:	28 19	16°C	30+ 27	
#3 1/8" BOTT:	10 13	16°C	14 18	17 18
#4 3/8" BOTT:	13 13	16°C	18 18	
3/4" BOTT:	13 13	16°C	18 18	
HEADER:				

STUD # 3: SIZE & LOCATION: 2X10X10' B.C. KILN-DRY DEL. JULY 2/86

MID-LENGTH	MC	T	MC/T	AV.
JULY 2/87 #1 1/8" TOP:	10 10	15°C	14 14	17 14
#2 3/8" TOP:	13 10	15°C	18 14	
3/4" TOP:	13 10	15°C	18 14	
FEB 24/87 #3 1/8" BOTT:	13 13	15°C	18 18	20 20
14' LENGTH #4 3/8" BOTT:	15 15	15°C	21 21	
3/4" BOTT:	19 15	15°C	27 21	
HEADER:				

STUD # 4: SIZE & LOCATION: 2X10X16' B.C. KILN-DRY DEL. MAR 31, 1987

MID-LENGTH	MC	T	MC/T	AV.
#1 1/8" TOP:	19 19	15°C	27 27	29
#2 3/8" TOP:	22 22	15°C	30+ 30+	
3/4" TOP:	25 30+	15°C	30+ 30+	
#3 1/8" BOTT:	25	15°C	30+	30+
3/8" BOTT:	30+	15°C	30+	
3/4" BOTT:	30+	15°C	30+	
HEADER:				

GENERAL COMMENTS: ALL KILN-DRY LUMBER FROM BRITISH COLUMBIA.
ALL MLB 2X8 LUMBER WAS 30+ MOISTURE CONTENT.

WOOD FRAMING MOISTURE STUDY

LOCATION: CHARLOTTETOWN, P.E.I. DATE: JUNE 4, 1987

CONTRACTOR NAME: HOUSE #22

LUMBER SUPPLIER: LOCAL (P.E.I.)

LENGTH OF TIME FROM DELIVERY TO ERECTION:

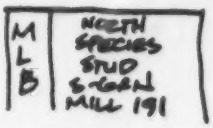
ILLUSTRATE GRADE STAMP: 

PHOTO NO. OF STAMP: 19-24

WEATHER CONDITIONS: 17°C AND SUNNY

PHOTO NO. OF SITE: 18

STUD # 1: SIZE & LOCATION: 2x6 SOUTH WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	13	18°C	18	20
3/8"TOP:	15	18°C	21	
3/4"TOP:	15	18°C	21	
1/8"BOTT:	—	—	—	—
3/8"BOTT:	—	—	—	
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

STUD # 2: SIZE & LOCATION: 2x6 EAST WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	13	18°C	18	20
3/8"TOP:	15	18°C	21	
3/4"TOP:	15	18°C	21	
1/8"BOTT:	—	—	—	—
3/8"BOTT:	—	—	—	
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

STUD # 3: SIZE & LOCATION: 2x6 WEST WALL

	MID-LENGTH	MC	T	MC/T	AV.
#1	1/8"TOP:	19	18°C	26	29
	3/8"TOP:	30+	18°C	30+	
	3/4"TOP:	30+	18°C	30+	
#2	1/8"BOTT:	13	18°C	18	20
	3/8"BOTT:	15	18°C	21	
	3/4"BOTT:	19	18°C	26	
	HEADER:	—	—	—	

STUD # 4: SIZE & LOCATION: 2x6 NORTH WALL

MID-LENGTH	MC	T	MC/T	AV.
1/8"TOP:	13	18°C	18	20
3/8"TOP:	15	18°C	21	
3/4"TOP:	15	18°C	21	
1/8"BOTT:	—	—	—	—
3/8"BOTT:	—	—	—	
3/4"BOTT:	—	—	—	
HEADER:	—	—	—	

GENERAL COMMENTS: 1x6 BOARD SHEATHING: 13 15 (18 21) 2x10 FLOOR JOISTS 13 15 15 (18 21 21)
2x4 STUDS 19 19 22 (26 26 30+) ROOF TRUSSES 13 15 19 (18 21 26)

APPENDIX 'B'

National Building Code
Requirements for lumber and wood products,
moisture content and grade markings.

SUBSECTION 9.3.2. LUMBER AND WOOD PRODUCTS

Grade marking

9.3.2.1. Lumber for joists, rafters, trusses and beams and for the uses listed in Table 9.3.2.A. shall be identified by a grade stamp to indicate its grade as determined by the NLGA "Standard Grading Rules for Canadian Lumber." (See Appendix A.)

9.3.2.2. Except for joists, rafters, trusses and beams, visually graded lumber shall conform to the grades in Table 9.3.2.A. (See Article 9.23.4.1. for joists, rafters and beams and Article 9.23.13.14. for trusses).

9.3.2.3. Machine stress rated lumber shall conform to the requirements of Subsection 4.3.1.

9.3.2.4. Waferboard and plywood used for roof sheathing, wall sheathing and subflooring shall be legibly identified on the face of the material indicating the manufacturer of the material, the standard to which it is produced and that the material is of an exterior type.

Moisture content

9.3.2.5. Moisture content of lumber shall be not greater than 19 per cent at the time of installation.

9.3.2.6. Lumber dimensions referred to in this Part are actual dimensions determined in conformance with CSA O141, "Softwood Lumber."

9.3.2.7. The thicknesses specified in this Part for plywood, hardboard, particleboard and waferboard shall be subject to the tolerances permitted in the standards referenced for these products unless specifically indicated herein.

9.3.2.8. Joist, rafter, lintel and beam members up to 5 per cent less than the actual Canadian standard sizes may be used provided the allowable spans for the grade and species of lumber under consideration are reduced 5 per cent from those shown in the span tables for full size members.

Table 9.3.2.A.
Forming Part of Article 9.3.2.2.

MINIMUM LUMBER GRADES FOR SPECIFIC END USES				
Use	BOARDS[1]			FRAMING
	Paragraph in the NLGA grading rules under which boards are graded			
	All species		Eastern White Pine & Red Pine	All species
	Para 113	Para 114	Para 118	
Stud wall framing (loadbearing members)	—	—	—	Standard, Stud, No. 2
Stud wall framing (non-loadbearing members)	—	—	—	Stud, Utility No. 3
Plank frame construction (loadbearing members)	No. 3 Common	—	No. 3 Common	No. 2
Plank frame construction (non-loadbearing members)	No. 5 Common	—	No. 5 Common	Economy, No. 3
Posts and beams less than 114 mm in thickness	—	—	—	Standard, No. 2
Posts and beams at least 114 mm in thickness	—	—	—	Standard
Roof sheathing	No. 3 Common	Standard	No. 4 Common	—
Subflooring	No. 3 Common	Standard	No. 3 Common	—
Wall sheathing when required as a nailing base	No. 4 Common	Utility	No. 4	—
Wall sheathing not required as a nailing base	No. 5 Common	Economy	No. 5	—
Column 1	2	3	4	5

Note to Table 9.3.2.A.:
[1] See Appendix A.

9.3.2.9. Where wood is pressure treated to resist termites, such treatment shall be in accordance with the requirements of one of the following standards:

CSA O80.1, "Preservative Treatment of All Timber Products by Pressure Processes,"

CSA O80.2, "Preservative Treatment of Lumber, Timber, Bridge Ties and Mine Ties by Pressure Processes,"

CSA O80.9, "Preservative Treatment of Plywood by Pressure Processes," or

CSA O80.15, "Preservative Treatment of Wood for Building Foundation Systems, Basements and Crawl Spaces by Pressure Processes."

GRADE MARKINGS OF CANADIAN LUMBER

INTRODUCTION

The grade mark of a CLS certified agency on a piece of lumber indicates its assigned grade, species or species combination, moisture condition at time of surfacing, the responsible grader or mill of origin and the CLS certified agency under whose supervision the grading and marking was done.

Canadian Lumber conforming to CSA O141-1970, "Softwood Lumber" is normally graded to the NLGA Standard Grading Rules for Canadian Lumber, published by the National Lumber Grades Authority. If graded to rules other than NLGA, the grade mark indicates the grading rule used.

The NLGA rules specify standard grade names and grade name abbreviations for use in grade marks to provide identification of lumber grades. In a similar fashion standard species names or standard species abbreviations, symbols or marks are provided in the rules for use in grade marks.

If lumber is graded in accordance with the 1970 NLGA Standard Grading Rules for Canadian Lumber, grade marks will denote its moisture condition at the time of surfacing. "S-DRY" in the mark indicates the lumber was surfaced at a moisture content not exceeding 19 per cent. "MC 15" indicates a moisture content not exceeding 15 per cent. "S-GRN" in the grade mark signifies that the lumber was surfaced at a moisture content higher than 19 per cent at a size to allow for natural shrinkage during seasoning.

Lumber species in Tables D-1 in Appendix D and C-1 to C-6 in Appendix C are identified by the standard commercial names for individual species given in CSA O141-1970, "Softwood Lumber." Lumber is generally marketed by grouping species in commercial species combinations as identified in Table D-1. The maximum allowable spans for these combinations are listed in Tables B-1 to B-11 in Appendix B. Some species of lumber are also marketed individually. Since the allowable spans for a commercial species combination is based on the weakest species in the combination, the use of these spans are permitted for any individual species included in the combination.

SPECIES DESIGNATIONS AND ABBREVIATIONS

Commercial Designation of Species or Species Combination	Abbreviation Permitted on Grade Stamps	Species Included
Douglas Fir–Larch	D Fir–L (N)	Douglas Fir, Western Larch
Hem–Fir	Hem–Fir (N)	Western Hemlock, Amabilis Fir
Spruce–Pine–Fir	S–P–F, or Spruce–Pine–Fir	White Spruce, Engelmann Spruce, Black Spruce, Red Spruce, Lodgepole Pine, Jack Pine, Alpine Fir, Balsam Fir
Eastern Hemlock–Tamarack	Hem–Tam (N)	Eastern Hemlock, Tamarack
Western Cedars	W Cedar (N)	Pacific Coast Yellow Cedar, Western Red Cedar
Northern Aspen	N. Aspen	Aspen Poplar, Largetooth Aspen, Balsam Poplar
Coast Species	Coast Species	Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Coast Sitka Spruce
Northern Species	North Species	Any Canadian softwood covered by the NLGA Standard Grading Rules
Douglas Fir	D Fir (N)	Douglas Fir
Western Hemlock	W Hem (N)	Western Hemlock
Western Red Cedar	WR Cedar (N)	Western Red Cedar
Coast Sitka Spruce	C Sitka	Coast Sitka Spruce
Jack Pine	J Pine (N)	Jack Pine
Lodgepole Pine	L Pine (N)	Lodgepole Pine
Ponderosa Pine	P Pine	Ponderosa Pine
Red Pine	R Pine	Red Pine
Western White Pine	WW Pine	Western White Pine
Eastern White Pine	East Pine Pine (N) EW Pine (N)	Eastern White Pine
Alpine Fir	Alpine Fir (N)	Alpine Fir
Aspen Poplar	Aspen (N)	Aspen Poplar

A-9.3.2.1. Grade Marking of Lumber. Lumber is generally grouped for marketing into the species combinations contained in the following table. The maximum allowable spans for those combinations are listed in the span tables for joists, rafters and beams. Some species of lumber are also marketed individually. Since the allowable span for a commercial species combination is based on the weakest species in the combination, the use of the span is permitted for any individual species included in the combination.

Facsimiles of typical grade marks of lumber associations and grading agencies certified by the Canadian Lumber Standards (CLS) Administrative Board to grade mark lumber in Canada are shown in the following table. Certification by the CLS Administrative Board applies to the inspection, grading and grade marking of lumber, including mill supervisory service, in accordance with CSA Standard O141, "Softwood Lumber."

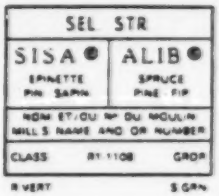
The grade mark of a CLS certified agency on a piece of lumber indicates its assigned grade, species or species combination, moisture condition at the time of surfacing, the responsible grader or mill of origin and the CLS certified agency under whose supervision the grading and marking was done.

Canadian lumber is graded to the NLGA Standard Grading Rules for Canadian Lumber, published by the National Lumber Grades Authority. The NLGA rules specify standard grade names and grade name abbreviations for use in grade marks to provide positive identification of lumber grades. In a similar fashion standard species names or standard species abbreviations, symbols or marks are provided in the rules for use in grade marks.

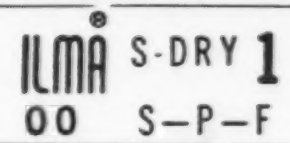
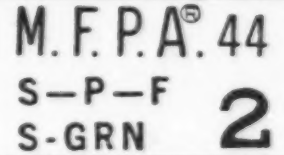
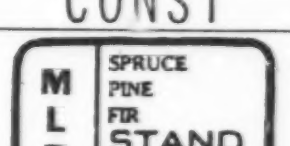
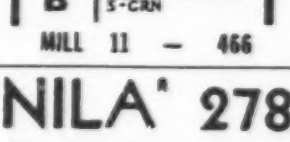
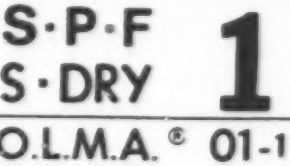
Grade marks denote the moisture content of lumber at the time of surfacing. "S-DRY" in the mark indicates the lumber was surfaced at a moisture content not exceeding 19 per cent. "MC 15" indicates a moisture content not exceeding 15 per cent. "S-GRN" in the grade mark signifies that the lumber was surfaced at a moisture content higher than 19 per cent at a size to allow for natural shrinkage during seasoning.

Each mill or grader is assigned a permanent number. The point of origin of lumber is identified in the grade mark by use of a mill or grader number or by the mill name or abbreviation. The CLS certified agency under whose supervision the lumber was grade marked is identified in the mark by the registered symbol of the agency.

FACSIMILES OF GRADE MARKS USED BY CANADIAN LUMBER MANUFACTURING ASSOCIATIONS AND AGENCIES AUTHORIZED TO GRADE MARK LUMBER IN CANADA

FACSIMILE OF GRADE MARK	ASSOCIATION OR AGENCY
A.F.P.A.® 00 S—P—F S-DRY STAND	Alberta Forest Products Assoc. 204 - 11710 Kingsway Avenue Edmonton, Alberta T5G 0X5
	Service d'inspection des sciages de l'Atlantique Atlantic Lumber Inspection Bureau A Branch of Quebec Lumber Manufacturers Association 580 Grande-Allée Est Suite 540 Québec, Québec G1R 2K2
CLA S-P-F 100 No. 1 S-GRN.	Canadian Lumbermen's Association 27 Goulburn Avenue Ottawa, Ontario K1N 8C7
LMA 1 S-GRN 1 1 D FIR-N	Cariboo Lumber Mfrs. Association 301 - 197 2nd Avenue North Williams Lake, B.C. V2G 1Z5
W. CEDAR S-GRN.-(N) 100 No 3	Council of Forest Industries of British Columbia 1500 - 1055 West Hastings Street Vancouver, B.C. V6E 2H1

FACSIMILES OF GRADE MARKS USED BY CANADIAN LUMBER MANUFACTURING ASSOCIATIONS AND AGENCIES AUTHORIZED TO GRADE MARK LUMBER IN CANADA

FACSIMILE OF GRADE MARK	ASSOCIATION OR AGENCY
	Interior Lumber Manufacturers Association 295 - 333 Martin Street Penticton, B.C. V2A 5K7
	Manitoba Forest Products Association 14-G 1975 Corydon Avenue Winnipeg, Manitoba R3P 0R1
	Central Forest Products Association 14-G 1975 Corydon Avenue Winnipeg, Manitoba R3P 0R1
	Maritime Lumber Bureau P.O. Box 459 Amherst, Nova Scotia B4H 4A1
	Northern Interior Lumber Sector 514 - 550 Victoria Street Prince George, B.C. V2L 2K1
	Ontario Lumber Manufacturers Association Suite 414 - 159 Bay Street Toronto, Ontario M5J 1J7

FACSIMILES OF GRADE MARKS USED BY CANADIAN LUMBER MANUFACTURING ASSOCIATIONS AND AGENCIES AUTHORIZED TO GRADE MARK LUMBER IN CANADA

FACSIMILE OF GRADE MARK	ASSOCIATION OR AGENCY
S. T. B. ® 101 S-P-F CONST. S-GRN	Saskatchewan Forest Products Corporation 550 First Avenue East Prince Albert, Saskatchewan S6V 2A5
S-P-F-GRN STUD 031	L'association des manufacturiers de bois de sciage du Québec Quebec Lumber Manufacturers Association 580 Grande-Allee Est Suite 540 Quebec, Quebec G1R 2K2
0 0 2 COM S-DRY 113 S—P—F	MacDonald Inspection 125 East 4th Avenue Vancouver, B.C. V5T 1G4
PLIB NLGA RULE No 1 S-GRN 00 HEM-FIR-N	Pacific Lumber Inspection Bureau Suite 1130 - 1411 Fourth Avenue Bldg. Seattle, Washington 98101 B.C. Division Office 1460-1055 West Hastings Street Vancouver, B.C. V6E 2G8
NWT 10 CONST S-P-F S-GRN	N.W.T. Grade Stamping Agency P.O. Box 2157 Yellowknife, N.W.T. X0E 1J7

APPENDIX 'C'

"Effects of Wood Shrinkage in Buildings"
National Research Council
Canadian Building Digest No. 244 - February 1987

National Research Council Canada | Conseil national de recherches Canada
Institute for Research in Construction | Institut de recherche en construction

CANADIAN BUILDING DIGEST

EFFECTS OF WOOD SHRINKAGE IN BUILDINGS

by A.T. Hansen

Abstract

This Digest discusses the nature of wood shrinkage and its effect on the performance of certain building assemblies.

Characteristics of Shrinkage

Wood shrinks when it dries and swells when it becomes wet. These dimensional changes vary with the species and the orientation of the wood fibres. When wood dries from its green condition, little or no shrinkage occurs until the moisture content falls below the fibre saturation level. At this level, all free moisture has been released from the cell cavities, leaving only the cell walls saturated. The moisture content at which this condition is reached varies, but averages 30% (based on the ratio of the weight of water to the oven-dried weight of wood). As the cell walls continue to release moisture, the wood shrinks almost in direct proportion to its moisture loss. That is, for each percentage drop in moisture content, the wood shrinks by about 1/30 of its total potential shrinkage.

The moisture level of the wood will eventually reach equilibrium with that of the surrounding air. This equilibrium moisture level depends principally on the relative humidity of the air. Air temperature has little effect on the equilibrium moisture level over its normal indoor range. Figure 1 shows the equilibrium moisture content of wood at various humidity levels and temperatures.

Wood shrinks (or swells) not only tangentially and radially, but longitudinally as well. Tangential shrinkage (concentric to the growth rings) is approximately twice the radial shrinkage (perpendicular to the growth rings). Shrinkage values for individual specimens of the same species can vary considerably, so computed values based on averages may be somewhat misleading. The average tangential shrinkage of spruce from the fibre saturation level to the oven-dried

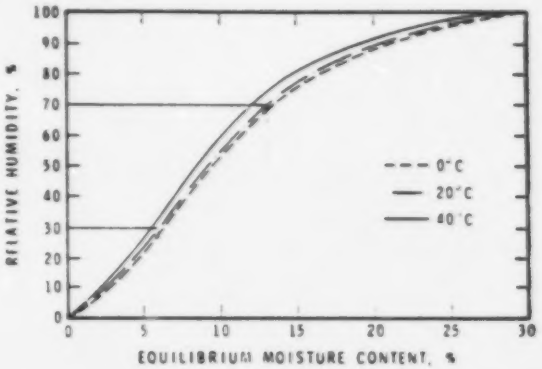


Fig. 1 Moisture content of wood at various relative humidities

state is 7 to 8%, while the average radial shrinkage is about 4%.[1] The longitudinal shrinkage for most species over this moisture range, however, is only 0.1 to 0.2% for so-called "normal" specimens. This small value is usually ignored in design, sometimes with unfortunate consequences. Greater longitudinal shrinkage can occur if the wood is badly cross-grained or contains juvenile or compression wood. Juvenile wood comes from trees that grew rapidly during their early years. Compression wood, i.e. wood subjected to unusual compression stresses during its growth, usually results when trees grow on a slant. It also forms immediately below large branches, so that lumber with many knots may exhibit greater-than-normal longitudinal shrinkage.

Plywood has shrinkage characteristics similar to lumber in the longitudinal direction. This stability is due to the much higher modulus of elasticity of wood with the grain than across the grain. Alternating the direction of the grain in adjacent plies, therefore, stabilizes the plywood in both directions.

Waferboard benefits from a similar stabilizing effect because the individual wafers are randomly organized. If waferboard is soaked, however, the

resulting increase in thickness can so weaken its internal bonds that it exhibits greater movement than would normal lumber.

The heartwood of freshly sawn lumber contains 30 to 100% moisture, depending on the species. The moisture content of the sapwood is usually much higher, from 100 to 200%. When exposed to air, lumber dries fairly rapidly in warmer weather to the fibre saturation level. It then dries at a decreasing rate until it is in equilibrium with the surrounding air. The rate of drying slows as the air temperature drops.

Equilibrium moisture contents for wood stored under cover during the summer in most inland areas vary from 11 to 12%, while in the coastal areas they range from 14 to 16%. At these levels about half to two-thirds of the total potential shrinkage will have occurred. If lumber is installed in a building before the equilibrium level is reached, even less of its potential shrinkage will have taken place, increasing the risk of shrinkage-related problems. For this reason most building codes in Canada specify that the moisture content of framing lumber must not exceed 19% at the time of installation.

Wood in heated buildings can be subjected to a wide range of humidity levels over an annual cycle. Winter humidity levels of 20 to 30% are common in houses, and may be even lower in other occupancies such as offices that generate little or no moisture. During the summer, outdoor humidity levels average 60 to 70% in most inland areas. These differences cause the equilibrium moisture content of wood to vary from 6% in winter to 12% in summer, assuming steady-state conditions are reached.

Effects on Metal Fasteners

Any shrinkage of the wood along the embedded length of metal fasteners causes their heads to rise above the wood surface while forcing the tips slightly deeper into the wood. The initial and final moisture contents of the wood, and the depth of fastener penetration, are the principal factors in determining the amount of outward movement, but subsequent seasonal cycles of moisture content changes can add to the initial movement.

Nails with annular grooves are generally affected less by shrinkage than plain shank nails because they require less penetration to achieve the same withdrawal resistance. Screw fasteners, which require even less penetration, are affected least.

Wood shrinkage can cause "nail popping" in drywall finishes. As the fasteners are eased out of the wood, a space is created between the drywall and its supports. Subsequent pressure on the drywall causes the fastener heads to push through the drywall cement covering them, resulting in nail popping.

The "nail popping" effect can also be observed in the ceiling, normally around the perimeter. As the fasteners are pushed outward, the downward movement of the ceiling is resisted by the wall membrane, forcing the fasteners through the cement covering. Since the ceiling perimeter is normally supported by the wall membrane, the nails around the perimeter serve no essential purpose. This source of nail popping can be eliminated by not putting ceiling fasteners within 300 mm of the walls.

Shrinkage produces similar effects when fasteners in the subflooring or underlayment are covered by thin materials such as vinyl. The raised fastener heads may show on the finished floor as a pattern of tiny bumps. This problem can be reduced by recessing the fastener heads into the wood before the flooring is laid.

Other Common Shrinkage Effects

Since the greater shrinkage occurs across the grain, wood-strip flooring is particularly vulnerable to the effects of shrinkage and swelling. Thus, when flooring is installed, its moisture content should be as close as possible to the level it will attain in service.

Flooring used below ground level may be subjected to humidity that will raise its equilibrium moisture level significantly above its kiln-dried level. To avoid buckling, the flooring should be stored in a location that will allow it to reach the higher moisture level before it is laid. A clearance of 10 to 15 mm around the floor perimeter should be provided to allow for expansion.

Although conventional wood framing is reasonably tolerant of the effects of shrinkage, using unseasoned lumber can invite problems, particularly if construction proceeds rapidly and the lumber is enclosed before much of the potential shrinkage has occurred. This prevents corrective action being taken, such as using shims to compensate for the shrinkage effects. Differential shrinkage commonly occurs around windows and doors where the lintels shrink away from the supporting jack studs. It also occurs where metal joist hangers support unseasoned wood joists around floor openings.

The manufacturing process of waferboard results in a final moisture content of about 2%, which is considerably below its moisture content in use. Accordingly, before it is installed, it should be allowed to reach a

moisture content level close to that expected in service. If waferboard or plywood is used in locations subject to high moisture levels, such as wall and roof sheathing, a gap should be left between the sheets to reduce the possibility of buckling due to expansion.

Wood Truss Uplift

An increasingly common effect of wood shrinkage is the upward bowing of wood trusses in winter. This causes cracks between the partitions and the ceiling of up to 20 mm in severe cases. Wood truss uplift is primarily caused by the differential longitudinal movement of the upper and lower chord members.

Air in a well-ventilated attic space contains approximately the same amount of moisture as the outside air. In winter the relative humidity of the outside air is fairly high; consequently, the top chords and web members will absorb moisture until equilibrium is reached with the surrounding air. The higher moisture content causes the top chords to lengthen.

The lower chords, however, experience a different phenomenon. Since in modern houses they are often covered with up to 300 mm of insulation, their average temperature in winter is closer to the indoor temperature. This causes the air spaces in the insulation adjacent to the wood to have a much lower relative humidity than the air adjacent to the top chords. As a result, the air spaces adjacent to the bottom chords absorb moisture from the wood until an equilibrium moisture level is reached. The moisture content in the lower chords may decrease to less than 10% during the coldest winter months, and cause the chords to shorten.[2] As the lower chords shrink and the top chords expand, the peaks of the trusses are forced upward. This forces web members attached near the peaks to pull the lower chords upward, which, in turn, causes cracks between the ceiling and the partitions. If the chord members contain compression or juvenile wood, the amount of movement can be significantly increased.[3]

Using unseasoned lumber may be a significant factor in truss uplift problems, particularly when the ceiling is installed before the moisture level of the trusses has been reduced to a reasonable level. Tests on roof trusses containing unseasoned juvenile wood have demonstrated that either upward or downward movement can occur as the wood dries, depending on whether the juvenile wood is located in the upper or lower chords.

A number of factors can influence the degree of uplift. Roof slope is one; the lower the slope, the greater the amount of arching for the same difference in moisture content between the upper and lower chords. The amount of insulation is another factor: the more insulation, the greater the difference in moisture content between the upper and lower chords. Differential shrinkage resulting from the lower moisture content of the partition framing in winter, compared with the exterior wall framing, can also contribute to the separation of the ceiling membrane from the partition.

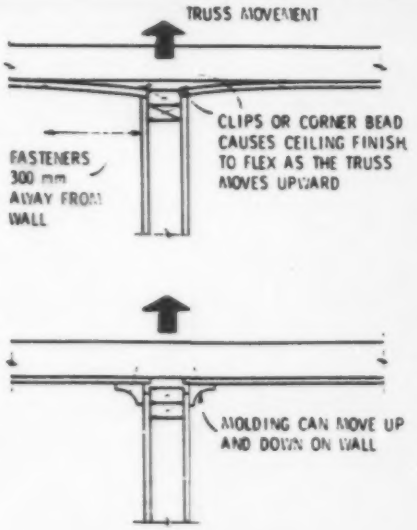

TRUSS MOVEMENT
CLIPS OR CORNER BEAD CAUSES CEILING FINISH TO FLEX AS THE TRUSS MOVES UPWARD
FASTENERS 300 mm AWAY FROM WALL
MOLDING CAN MOVE UP AND DOWN ON WALL

Fig. 2 Masking the effects of upward bowing

Thermal contraction, in the winter months, of the top chord relative to the bottom chord is insufficient to counteract arching caused by moisture changes. The weight of the roof assembly and the snow load, in most cases, only partially counteract truss uplift.

Even if seasoned lumber is used, roof truss uplift may not be avoidable without changing the present system of construction so that the top and bottom chords are exposed to the same environmental conditions. Because of the costs and adjustments this would entail, it seems more practical to modify the current system to allow the wood trusses to bow upwards without causing damage to the interior finish.

This can be achieved by eliminating ceiling fasteners within 300 mm of the partitions, and by coupling the ceiling to the partitions at their juncture so that the trusses can move upwards without breaking the joint between the partition and ceiling.[4] The ceiling membrane can be coupled to the partition by special clips or corner beads nailed to the tops of the partitions so that the ceiling membrane is forced to flex, rather than tear away from the partition, as the truss moves upward (Fig. 2).

Alternatively, 19 × 140 mm boards can be nailed to the tops of the partitions. The boards must be fitted between the trusses where the partitions are at right angles to the trusses (unless the ceiling is supported by furring strips).

If such "floating corners" have not been provided, damage at the partition can be masked by installing cove moldings fastened to the ceiling supports only. This permits the molding to slide up and down the wall with the seasonal movement of the trusses. Suspended ceilings can also be used. It may be necessary to seal cracks with adhesive tape before installing the molding or the suspended ceiling, to prevent air leakage into the attic if the vapour barrier has been damaged by the arching effect.

Concluding Remarks

Wood shrinkage can cause many problems, from nail popping to truss uplift. Using lumber whose moisture content does not exceed 19% should significantly reduce the incidence of most of these problems. It is possible to allow for truss uplift by using floating corners that will permit the ceiling to flex without tearing away from partitions. If floating corners are not used, corrective action is normally limited to concealing the damage by means of moldings or suspended ceilings.

References

1. Wood handbook: wood used as an engineering material. U.S. Dept. of Agriculture, Forest Products Laboratory, Forest Service Handbook No. 72, Washington, D.C., 1974.
2. Onysko, D.M., Bellosillo, S.B., and Aplin, E.N. Seasonal uplift of roof trusses: a progress report. Forintek Canada Corporation, Ottawa, 1980.
3. Gorman, Thomas M. Juvenile wood as a cause of seasonal arching in trusses. Forest Products Journal, Vol. 35, No. 11/12, Nov./Dec. 1985.
4. Special bulletin report on roof truss uplift. Prepared for the Technical Research Commitee, Housing and Urban Development Association of Canada, Toronto, 1980.

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APPENDIX 'D'

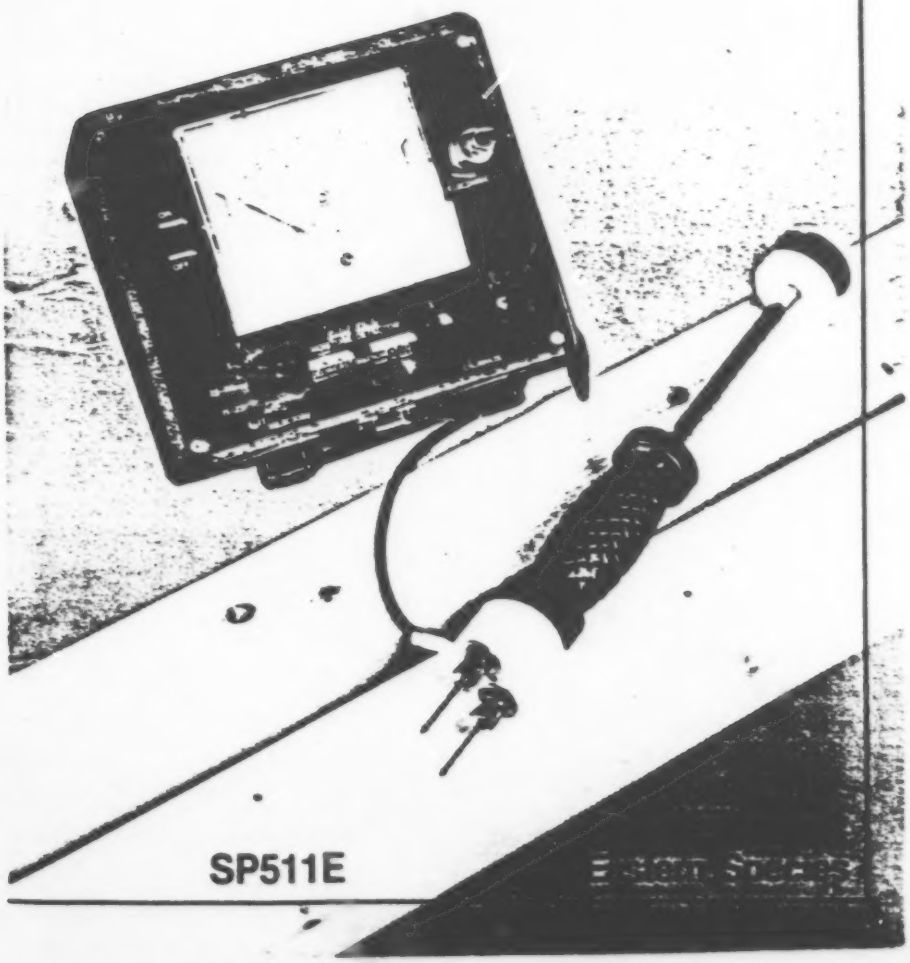
"Moisture Content Correction Tables
for the Resistance-Type Moisture Meter"
(revised temperature corrections)
Eastern Species
Forintek Canada Corp.
SP511E - August 1984

Forintek Canada Corp.

Moisture Content Correction Tables for the Resistance-Type Moisture Meter

(revised temperature corrections)

F. Pfaff and P. Garrahan



SP511E

Procedure for Taking Meter Readings

1 — Prepare the meter for measuring moisture content according to the manufacturer's operating instructions.

2 — Locate a number of boards which are representative of the general quality and condition of the lumber.

3 — Take a meter reading at a point near mid-width of the board and at least 50 cm from the board ends. The reading area must be free of defects such as knots, splits, resin pockets and decay.

4 — Drive the electrodes into the wood with the pins aligned parallel to the grain, to the desired depth.

5 — Take meter readings immediately after the pins are driven into the wood, and determine the average reading if more than one meter reading is taken.

6 — Use the appropriate temperature-species correction to determine the actual moisture content. If 4-pin electrodes are used, the meter readings must be converted to the equivalent 2-pin reading (Fig. 1) prior to using the correction tables.

7 — For species which characteristically contain varying amounts of « wetwood », such as aspen, balsam fir and old growth white pine, the correction tables should be used with the understanding that substantial variation in moisture measurement may be expected.

Table 10 — PINE, Jack

Wood Temperature (°C.)	(°F.)	METER READING 7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
−40	−40	16	18	19	21	23	25	27	29	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
−35	−31	15	17	19	21	22	24	26	28	30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
−30	−22	14	16	18	20	21	23	25	27	29	30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
−25	−13	14	15	17	19	21	22	24	26	28	29	—	—	—	—	—	—	—	—	—	—	—	—	—	—
−20	−4	13	15	16	18	20	22	23	25	27	28	30	—	—	—	—	—	—	—	—	—	—	—	—	—
−15	5	12	14	16	17	19	21	22	24	26	27	29	—	—	—	—	—	—	—	—	—	—	—	—	—
−10	14	12	13	15	17	18	20	21	23	25	26	28	30	—	—	—	—	—	—	—	—	—	—	—	—
−5	23	11	13	14	16	18	19	21	22	24	25	27	28	30	—	—	—	—	—	—	—	—	—	—	—
0	32	11	12	14	15	17	18	20	21	23	24	26	27	29	—	—	—	—	—	—	—	—	—	—	—
5	41	10	12	13	15	16	18	19	21	22	24	25	27	28	30	—	—	—	—	—	—	—	—	—	—
10	50	10	11	13	14	16	17	18	20	21	23	24	26	27	29	30	—	—	—	—	—	—	—	—	—
15	59	9	11	12	13	15	16	18	19	20	22	23	25	26	28	29	30	—	—	—	—	—	—	—	—
20	68	9	10	12	13	14	16	17	18	20	21	22	24	25	27	28	29	—	—	—	—	—	—	—	—
25	77	8	10	11	12	14	15	16	18	19	20	22	23	24	26	27	28	30	—	—	—	—	—	—	—
30	86	8	9	11	12	13	14	16	17	18	20	21	22	23	25	26	27	29	30	—	—	—	—	—	—
35	95	8	9	10	11	13	14	15	16	18	19	20	21	23	24	25	26	28	29	30	—	—	—	—	—
40	104	7	8	10	11	12	13	15	16	17	18	19	21	22	23	24	26	27	28	29	30	—	—	—	—
45	113	7	8	9	10	12	13	14	15	16	18	19	20	21	22	23	25	26	27	28	29	—	—	—	—
50	122	7	8	9	10	11	12	13	15	16	17	18	19	20	22	23	24	25	26	27	28	30	—	—	—

Table 11 — SPRUCE, Eastern White

Wood Temperature (°C.)	(°F.)	METER READING 7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
−40	−40	16	18	20	22	24	26	28	30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
−35	−31	15	17	19	21	23	25	27	29	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
−30	−22	15	17	19	20	22	24	26	28	30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
−25	−13	14	16	18	20	21	23	25	27	29	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
−20	−4	13	15	17	19	21	22	24	26	28	30	—	—	—	—	—	—	—	—	—	—	—	—	—	—
−15	5	13	15	16	18	20	22	23	25	27	29	30	—	—	—	—	—	—	—	—	—	—	—	—	—
−10	14	12	14	16	17	19	21	22	24	26	28	29	—	—	—	—	—	—	—	—	—	—	—	—	—
−5	23	12	13	15	17	18	20	22	23	25	27	28	30	—	—	—	—	—	—	—	—	—	—	—	—
0	32	11	13	14	16	17	19	21	22	24	26	27	29	30	—	—	—	—	—	—	—	—	—	—	—
5	41	10	12	14	15	17	18	20	22	23	25	26	28	29	—	—	—	—	—	—	—	—	—	—	—
10	50	10	11	13	15	16	18	19	21	22	24	25	27	28	30	—	—	—	—	—	—	—	—	—	—
15	59	9	11	12	14	15	17	18	20	21	23	24	26	27	29	30	—	—	—	—	—	—	—	—	—
20	68	9	10	12	13	15	16	18	19	21	22	23	25	26	28	29	—	—	—	—	—	—	—	—	—
25	77	9	10	11	13	14	16	17	18	20	21	23	24	25	27	28	30	—	—	—	—	—	—	—	—
30	86	8	9	11	12	14	15	16	18	19	20	22	23	25	26	27	29	30	—	—	—	—	—	—	—
35	95	8	9	10	12	13	14	16	17	18	20	21	22	24	25	26	28	29	30	—	—	—	—	—	—
40	104	7	9	10	11	12	14	15	16	18	19	20	22	23	24	25	27	28	29	—	—	—	—	—	—
45	113	7	8	9	11	12	13	14	16	17	18	19	21	22	23	25	26	27	28	30	—	—	—	—	—
50	122	7	8	9	10	11	13	14	15	16	18	19	20	21	22	24	25	26	27	29	30	—	—	—	—